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41. 2010

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: GREGORY PA#: 22-005

Date: August 17, 1993 Time: 1345-1940

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Pierson, Pioneer

Visitors: Eric Strumsen, Pegasus Geologist

Weather/Seasonality Observations: Overcast; cool (65°F); cool, wet  
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #19: WR-1; #20:  
Shaft; #21: WR-3; #22: WR-2; #23: SW-5; #24: SW-4. Roll #2: #0:  
TP-1 and WR-4; #1: SW-3; #2: TP-2A and -2B; #3: SW-1; #4: SW-2.  
Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove mine  
wastes from active drainages; grade, amend, and revegetate.  
Study water treatment alternatives.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GREGORY PA#: 22-005

Legal Description: T 7N ; R 4W ; Sec. 4 , N 1/2 1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 23' 14" Longitude: W 112° 06' 48"

Primary Drainage Basin and Code: Clancy Creek/10030101

Secondary Drainage Basin: Clancy Creek

USGS Quadrangle map name(s): Jefferson City

Mine Type/Commodities: Hardrock/Lead, Zinc, Gold, Silver

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N      ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Helena Silver

Mines, Inc., Box 488, Coeur d'Alene, ID 83814. (208) 667-9565.

Relationship to other mines/sites in the area/district: Adjacent to Pegasus Gold Corp. Montana Tunnels mine property boundary.

Regulatory Status (Activity by other agencies)? Hardrock permits?       
Past Reclamation Activities? N/A

General site features: Elevation 5600' , Slope 4°-35° ,  
Aspect South to Southeast

Land use: Mining X , Recreational      , Residential      , Urban      ,  
Agricultural X , Other (Specify)     

Area of disturbed/unvegetated lands? 6 acres.  
Dimensions: 5 acres of waste rock dumps and approx. 0.75 acres of stressed vegetation in the drainage.

Predominant vegetation types: Scattered pines and aspens; grasses and some sage

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 3 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Mine site lies on a hillside north of an  
unnamed tributary to Clancy Creek; tailings lie at confluence of  
unnamed tributary and Clancy Creek. Water flows south in tributary  
to confluence with Clancy Creek, which flows west past the site.  
Site lies near contact of andesite with a tongue of diorite  
intrusive from main mass of quartz monzonite. Vein material left  
on the dump from the last operation is mostly pyrite and quartz  
with some sphalerite, arsenopyrite, galena, and a small amount of  
chalcopyrite.

Mining/milling history, ore type/tenor, host rock, gangue: Mine  
was located in 1864. Between 1917 and 1957, the site is credited  
with a total of 1,381 oz. Au, 66,655 oz. Ag, 38,470 oz. Cu, 862,370  
lbs. Pb, and 132,563 lbs Zn from 18,977 tons of ore; this may have  
included reworked mine dumps. The ore consists of argentiferous  
galena, sphalerite, arsenopyrite, and pyrite in a gangue of quartz  
and altered andesite.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Open  
Adits - Yes X, No    , # 2, Comment Caved  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three  
questions:

Period(s) of Operation: Unknown

Origin of Ore Milled - Custom Mill     Dedicated Mill X; Number and  
names of mines that supplied mill feed: Old Consolidated and Alta  
mines

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
A concentrator; reported to have a smelter pre-1929. Smelter stack  
is still standing.

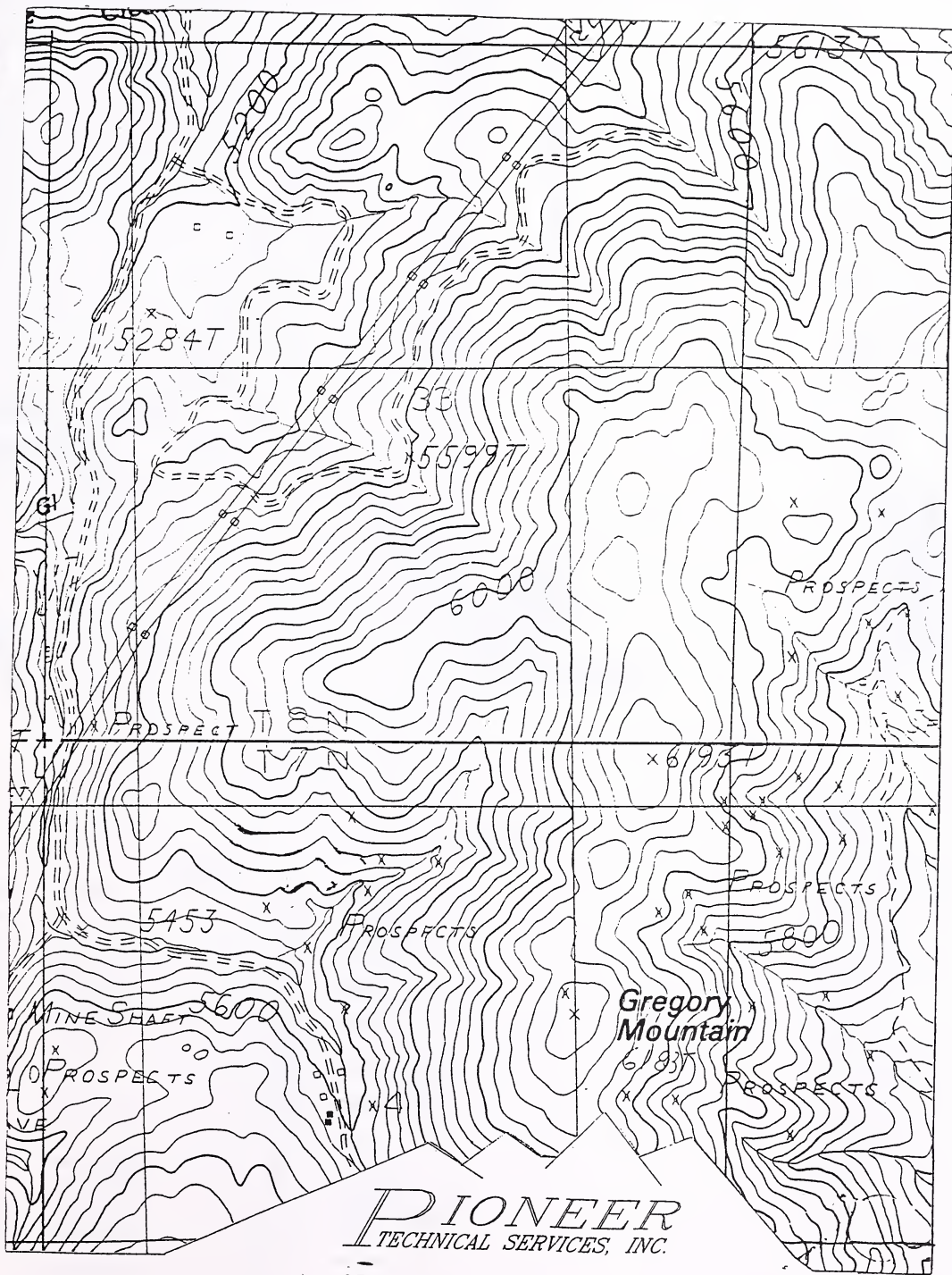
Montana Bureau of Mines and Geology  
Water Well Log Data

11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5430	07N 04W 05 CDCD	32.0	0.0	11.70
M:55785	07N 04W 03	95.0	8.0	35.00 (1)
M:55786	07N 04W 03	70.0	30.0	20.00 (2)
M:55787	07N 04W 03 DCA	95.0	8.0	35.00 (3)
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:5431	07N 04W 08 BDBB	268.2	0.0	18.91







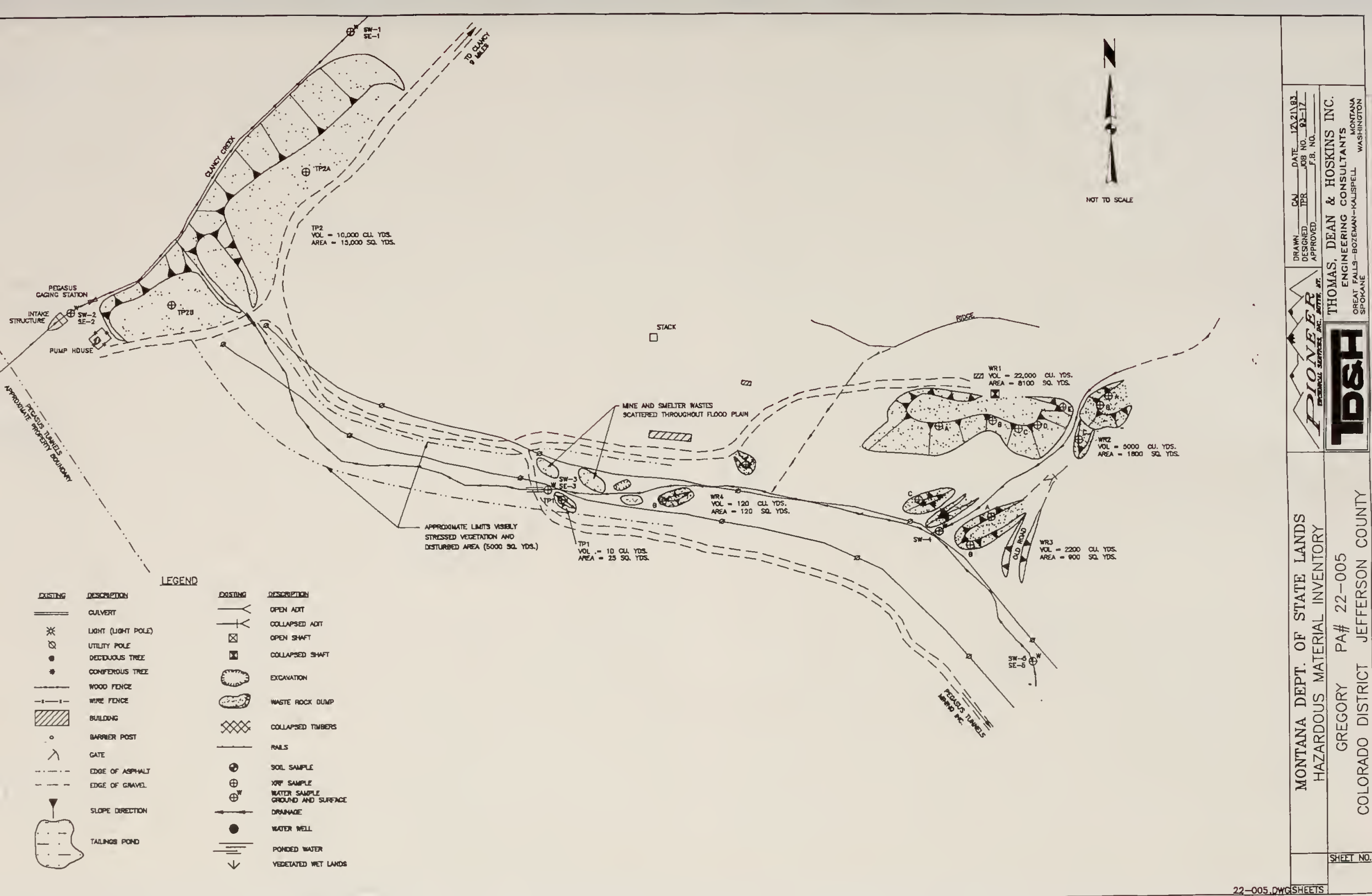
**PIONEER**  
TECHNICAL SERVICES, INC.

GREGORY, P.A. NO. 22-005

T07N, R04W, SECTION 04

SCALE: 1" = 1000'





DRAWN BY  
DESIGNED BY  
APPROVED BY

CAJ  
TPR  
[Signature]

DATE  
JOB NO.  
F.B. NO.

1/22/83  
83-17  
[Signature]

PIONEER  
ENGINEERING SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
WASHINGTON

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

GREGORY PA# 22-005  
COLORADO DISTRICT JEFFERSON COUNTY

SHEET NO.

22-005.DWG SHEETS



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Observed only what appeared to be "surface" tailings.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not observable.

Are tailings wet or dry (describe location of partially wetted tailings impoundments): \_\_\_\_\_  
Partially wetted in lower zone.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment present.

Comments on potential for mitigation: Remove from Clancy Creek floodplain.





# **SOURCE INVENTORY FORM**

SAMPLERS: Bullock

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	22,000	Large dump associated with shaft	None	< 3.5 (D)	0.06	22-005-WR-1	08/17/93 1900	T-Metals, ABA
WR-1B	WR		Ore pile adjacent to shaft	None	< 3.5 (D)	0.055			
WR-1C	WR		Southeast side of dump	None	5.1 (D)	0.035			
WR-1D	WR		Southeast corner	None	5.3 (D)	0.06			
WR-1E	WR		West side of dump	None	3.8 (D)	0.04			
WR-2A	WR	5,000	North side of dump, east end	None	< 3.5 (D)	0.045			
WR-2B	WR		North side of dump near knob, west end	None	< 3.5 (D)	0.05			
WR-2C	WR		Small south lobe of WR-2, west side near knob	None	< 3.5 (D)	0.045			
WR-3A	WR	2,200	South pile of WR-3, north side	None	< 3.5 (D)	0.045	22-005-WR-2	08/17/93 1910	T-Metals, ABA
WR-3B	WR		South pile of WR-3, south side near knob	None	< 3.5 (D)	0.055			
WR-3C	WR		Northwest pile of WR-3, north side	None	4.7 (D)	0.03			
WR-4A	WR	10	Small pile east of possible foundation, off knob	None	< 3.5 (D)	0.055	22-005-WR-3	08/17/93 1920	T-Metals, ABA
WR-4B	WR	40	Small pile south of possible foundation, west end	None	3.7 (D)	0.045			
TP-1	TAIL	10	In stream prior to access road	None	4.7 (D)	0.01	22-005-TP-1	08/17/93 2220	T-Metals, ABA
TP-2A	TAIL	10,000	Downstream of lower tailings, north end	None	5.9 (D)	0.04	22-005-TP-2	08/17/93 2220	T-Metals, ABA
TP-2B	TAIL		Upstream	None	6.0 (D)	0.04			

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 22-005-WR-1 is composite of WR-1A through -1E, and WR-2A through -2C. 22-005-WR-2 is composite of WR-3A through -3C. 22-005-WR-3 is composite of WR-4A and -4B. 22-005-TP-1 is a grab of TP-1. 22-005-TP-2 is composite of TP-2A and -2B.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes X, No\_\_\_, Number: 1 Identification: In  
intermittent drainage near WR-2

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 73

Distance to nearest well used for drinking? Approx. 1.5 miles down  
Clancy Creek

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh  
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.

Reactive, uncontained waste in contact with surface water is probably  
causing localized groundwater contamination.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Clancy Creek; unnamed tributary

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): Unnamed tributary flows over waste rock.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 2.44 during investigation  
High Flow: 4.0 cfs, Average Flow: 1.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Unnamed tributary flows over waste rock and tailings in Clancy Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Possible irrigation and agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes     ,  
No X, Distance downstream (ft)?      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.

# SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu\text{S}/\text{cm}$ @ 25°C	Eh mV	Temp °C	ALK. mg/L as $\text{CaCO}_3$	Flow' cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Clancy Creek downstream from tailings and confluence	7.58	240	100.9	13.8	30	2.44 cfs (M)	22-005-SW-1	08/17/93 1700	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SW-2	SW	Upstream Clancy Creek at Pegasus gaging station	7.73	190	109.9	13.3	40	N/A	22-005-SW-2	08/17/93 1715	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SW-3	SW	Downstream tributary sample above culvert	2.66	1140	512.3	14.5	0	35 gpm (E)	22-005-SW-3	08/17/93 1730	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-3	SE	Downstream tributary sample above culvert	N/A	N/A	N/A	N/A	N/A	N/A	22-005-SE-3	08/17/93 1730	T-Metals
SW-4	SW	Month of small northern tributary coming downstream WR-2	2.51	1540	558.3	13.4	0	10 gpm (E)	22-005-SW-1	08/17/93 1810	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SW-5	SW	Upgradient tributary sample	6.85	430	365.2	12.4	80	10 gpm (E)	22-005-SW-5	08/17/93 1830	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-5	SE	Upgradient tributary sample	N/A	N/A	N/A	N/A	N/A	N/A	22-005-SE-5	08/17/93 1830	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Flume staff gauge reading at SW-2 was 0.45'.

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

##### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

##### General Potential for AMD Mitigation:

Area available for treatment (acres)? 4 acres at the mine area.

Wetlands present: Yes X, No     , Describe: Approx. 2.5 acres of wetlands are present between the mine and Clancy Creek.

Carbonate rocks/soils: Yes     , No X, Describe:                     

#### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X; 100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ; Comments                     

Nearest residence(ft or miles)? Approx. 1.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LEFT)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO DUST/LOW/MODERATE)
WR-1	SO3; FEOX; pH	Wet	72,900	72,900	Yes	Low
WR-2	SO3; FEOX; pH	Wet	14,400	14,400	Yes	Low
WR-3	SO3; FEOX; pH	Wet	8,100	8,100	Yes	Low
WR-4	SO3; FEOX; pH	Wet	1,080	1,080	Yes	Low
TP-1	SO3	Wet	225	210	Yes	Low
TP-2	Low pH	Wet	135,000	128,000	Yes	Moderate

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Pegasus Montana  
Tunnels project has much of the area fenced.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage\_\_\_\_, Secondary Drainage X, No Information\_\_\_\_

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations: Smelter stack

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: Clancy Creek is eroding TP-2.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

Deckler, Jeffrey Harris, Characterization of Four Inactive Hard Rock Mines in Western Montana, Thesis written for Montana State University, Bozeman, Montana, August 1982.

MBMG, Gregory Mine, Jefferson County, Montana, File 90.0.

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 47-48.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Analytical Data for Gregory Mine, June 7, 1977.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Gregory, Prepared by Delta Engineering, Date Unknown.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Gregory, Prepared by Northern Engineering and Testing, July 15, 1988.

MDSL/AMRB Files, Problem Area Data Sheet for Gregory, Prepared by Mark Carlstrom and Ben Mundie, September 11, 1979.

Mining Record, The, Helena Silver Mines Leases Its Gregory Mine Property, October 15, 1986.

Northern Testing Laboratories, Report of Geotechnical Investigation Hard Rock Mine Dump and Mill Pond Project Western Montana, Volume I, November 1982.

Tout, Charles A., Data on the Gregory Mine, Prepared for William Cartwright, December 20, 1938.

USGS, Geology and Mineral Deposits of the Jefferson City Quadrangle, Montana, Professional Paper 428, Author Unknown, 1963, pp. 71-72.

USGS, Topographic Map, Jefferson City, Montana, 7 1/2 minute Quadrangle, 1985.





LABORATORY ANALYTICAL DATA

GREGORY  
PA NO. 22-005



Gregory PA# 22-005  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
22-005-SE-3	5820 J	92.1 J	6.6 J	5.67 U	8.67	331	90700	0.208	334	7.4 U	2180 J	17.9 U	1060 J	NR
22-005-SE-5	22 J	125 J	0.5 U	6.5 J	11.1 J	14.1 JX	13200 J	0.039	908 J	30 J	83 J	6 U	158 JX	NR
22-005-TP-1	5870 J	81.2 J	1.4 J	1.8 J	4.4 J	161 JX	21700 J	0.063	60.8 J	6 J	577 J	5 U	195 JX	NR
22-005-TP-2	1740 J	104 J	0.8 J	4.3 J	8.2 J	204 JX	19700 J	0.04	705 J	5 J	347 J	7 U	273 JX	NR
22-005-WR-1	1060 J	45.5 J	4.1 J	3 J	1.2 U	453 JX	35500 J	0.457	163 J	14 J	11500 J	5 U	1090 JX	NR
22-005-WR-2	381 J	90.4 J	0.6 U	2.1 U	1.5 U	168 JX	30100 J	0.412	70.5 J	8 J	4910 J	7 U	220 JX	NR
22-005-WR-3	770 J	101 J	0.6 J	2.3 J	8 J	129 JX	58400 J	0.544	181 J	9 J	6790 J	6 U	563 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	POTENTIAL	NEUTRAL. POTENTIAL	SULFUR %	CO	CR	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CYANIDE
22-005-TP-1	0.48	15	-6.7	-21.	0.46	<0.01	0.02	0	6.73	3.61	54.8	18.4	16.7	6.1	6.34	0.31	0.07	0.01	0.01
22-005-TP-2	0.29	9.06	-3.3	-12.	0.24	0.01	0.04	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
22-005-WR-1	3.98	124	-7.3	-132	1.75	1.52	0.71	47.5	14.7	18.4	16.7	6.1	6.34	0.31	0.07	0.01	0.01	0.01	0.01
22-005-WR-2	1.87	58.4	-3.7	-62.	0.94	0.47	0.46	14.7	18.4	16.7	6.1	6.34	0.31	0.07	0.01	0.01	0.01	0.01	0.01
22-005-WR-2DUP	1.9	59.4	-3.2	-62.	0.98	0.43	0.49	13.4	16.7	6.1	6.34	0.31	0.07	0.01	0.01	0.01	0.01	0.01	0.01
22-005-WR-3	2.1	65.6	-5.7	-71.	2.03	0.01	0.06	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
22-005-WR-3DUP	2.13	66.5	-6.3	-72.	2.05	0.01	0.07	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)
22-005-SW-1	4.45	7.13	2.93 J	9.7 U	6.83 U	39.5 J	146	0.27 J	591	12.7 U	14.4	30.7 U	640
22-005-SW-2	3.17	5.8	3 J	9.7 U	6.83 U	2.5 J	105	0.22 J	91.9	15.5	0.75	30.7 U	31.1
22-005-SW-3	30.3	20.2	84.9 J	33.7	8.07	1020 J	10800	0.34 J	14000	22.3	200	36.5	14900
22-005-SW-4	216	2.01 U	135 J	38.8	6.83 U	2230 J	51700	0.39 J	9670	31.7	48.1	30.7 U	20400
22-005-SW-5	4.81	43.7	2.57 U	9.7 U	6.83 U	1.55 U	510	0.29 J	133	14.6	3.73	30.7 U	29.9

Wet Chemistry

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-005-SW-1	161	< 5.0	58	< 0.05	NR
22-005-SW-2	131	< 5.0	30	< 0.05	NR
22-005-SW-3	851	< 5.0	556	< 0.05	NR
22-005-SW-4	878	< 5.0	586	< 0.05	NR
22-005-SW-5	260	< 5.0	97	< 0.05	NR

LEGEND

- SE3 - Downstream tributary sample above culvert.  
SE5 - Upstream tributary sample.  
TP1 - Sample of the TP1 subsample.  
TP2 - Composite of subsamples TP2A and 2B.  
WR1 - Composite of subsamples WR1A through 1E, and 2A through 2C.  
WR2 - Mouth of small tributary coming downstream of waste rock dump 2.  
WR3 - Composite of subsamples WR3A and 3C.  
WR4 - Mouth of small tributary coming downstream of waste rock dump 2.  
BACKGROUND - From the Bertha Mines (22-002-SS-1).  
WR2DUP - Duplicate of the 22-005-WR-2 sample.  
WR3DUP - Duplicate of the 22-005-WR-3 sample.
- SW1 - Clancy Creek downstream from tailings and confluence.  
SW2 - Upstream Clancy Creek at Pegasus gauging station.  
SW3 - Downstream tributary sample above culvert.  
SW4 - Mouth of small tributary coming downstream of waste rock dump 2.
- U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested



XRF ANALYSIS RESULTS

GREGORY  
PA NO. 22-005



## XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
20-005-WR1-A	21840.7	26351.2				227.431 *	65068.6	358.097 *		792.961	167.328 *	71.8411
20-005-WR1-B	19465.2	41383				3471.23	16601.1		61.4756 *	6341.67	87.1718 *	114.747
20-005-WR1-C	12710.6	10873.8				2328.34	11624		55.4703 *	2721.15		60.4175
20-005-WR2-A	14319.5	58202.6				2530.41	14592.6		66.0025 *	4571.4		300.583
20-005-WR2-B	11948.6	42063.9				1425.86	19244.4	198.974 *		1731.71	81.4621 *	68.6711
20-005-WR2-C	9892.54	28417.6				2070.08	33318.3	253.77 *	50.0558 *	970.123	82.2993 *	57.0611
20-005-WR3-A	11807.8	34341.5				1474.49	67003.2	304.149 *	78.7393 *	1778.49	1582.89	492.158
20-005-WR3-B	15215	35560.2				4254.37	32305		226.974	4477.12	203.55	60.7406
20-005-WR4-A	10685.1	86868.3				12148	22983		39.8444 *	2720.57	172.552	79.8384
20-005-WR4-B	14774.4	41216.9				2207.31	18572.6	263.157 *	47.9459 *	1250.29	38.0041 *	237.384
20-005-WR4-C	13883.4	20475.3				15700.8	63728		968.808	7874.66	3257.45	186.176
20-005-WR5-A	21260.2	77681.1				740.798	16112			213.371	132.303	95.5782
20-005-WR5-B	33604.9	9298.13		3198.79		124407	46927.2			234.707	3077.54	79.1122
20-005-WR1-COMP	17799.2	34374.3				1591.43	31416.4		103.956 *	2396.38	66.3848 *	105.091
20-005-WR2-COMP	15664.4	31146.1				2727.57	51930		86.4606 *	2421.47	1017.92	364.733
20-005-WR3-COMP	14209.2	70603				14767.3	40287.9		331.449	5876.87	950.901	167.625
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
132.567			761.312	209.982			75.4163					
102.934			442.213	92.766			416.358					
139.536			403.08	41.6844			166.577					
192.219			1100.79	60.7556			147.137					
178.99			216.353	53.5077			156.614					
112.177			173.135	78.6959		106.948 *	93.5198					
86.0085			754.899	137.024			149.404	533.569 *				
20-005-WR3-A	43.7338 *		186.199	196.6			62.7734					
20-005-WR3-B	119.029		156.98	44.2953			145.042					
66.1365												
20-005-WR4-A												
20-005-WR4-B	84.5227		370.955	78.5054			329.637	264.559 *				
20-005-WR4-C	96.7138		130.135				154.175	658.109 *				
20-005-WR5-A	49.6629		17.5488 *	59.3846								
20-005-WR5-B	134.597		48.4108 *	218.916			59.7073	549.555 *				
20-005-WR1-COMP	159.984		585.908	88.9127			55.8567 *	178.166				
20-005-WR2-COMP	111.251		371.346	166.807			81.9813					
20-005-WR3-COMP	98.9725		829.645	99.23			225.439	361.342 *				

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

GREGORY  
PA NO. 22-005



# **AIMSS SCORESHEET**

SITE NAME:

GREGORY

PA NUMBER:

22-005

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	140.248
6		WELLS - 1 MI. x 2.5		7.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		70
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	77.5
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>4347688</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	151.909
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19	SW - TARGETS	FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	3
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>364582</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.993
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>8979</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		1
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	5
38		LIKELIHOOD SCORE	LINES 36 + 37C	5
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.869
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>0</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b> (LINES 10 + 24 + 35 + 44) / 100,000			<b>47.21</b>

LINE  
NO.

SITE NAME:  
PA NUMBER:

GREGORY  
22-005

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		1
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	40
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**



STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 59601

STATE MONTANA

COUNTY JEFFERSON

LAT.-LONG. 462314N 112 637W

SAMPLE LOCATION 7N 4W 4800

STATION CODE

ANALYSIS NUMBER 77W1080

DATE SAMPLED 06-07-77

DRAINAGE BASIN 0411 -U MISSOURI

TIME SAMPLED 1230

WATER FLOW RATE

METHOD SAMPLED GRAB

FLOW MEASUREMENT METHOD

SAMPLE SOURCE MINE DRAIN

ALTITUDE OF LAND SURFACE

WATER USE UNUSED

TOTAL WELL DEPTH BELOW LS

AQUIFER(S)

SWL ABOVE(+) OR BELOW LS

SAMPLED BY WQ8H

SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: WATER FLOWING THROUGH GREGORY MINE TAILIN

MG/L

MEQ/L

MG/L

MEQ/L

CALCIUM (CA)

BICARBONATE (HCO3)

MAGNESIUM (MG)

CARBONATE (CO3)

SODIUM (NA)

CHLORIDE (CL)

POTASSIUM (K)

SULFATE (SO4)

IRON (FE)

FLUORIDE (F)

MANGANESE (MN)

PHOSPHATE (PO4 AS P)

ALUMINUM (AL)

NO3+NO2 (TOT AS N)

SUM CATIONS

0.0

0.0

SUM ANIONS

188.000

3.914

LABORATORY PH

6.70

TOT HARDNESS (MG/L-CACO3)

FIELD WATER TEMPERATURE (C)

TOT ALKALINITY (MG/L-CACO3)

SUM DISS. IONS MEAS. (MG/L)

LABORATORY TURBIDITY (JTU)

LAB CONDUCTIVITY-UMHOS-25C

403.0

SODIUM ADSORPTION RATIO

A D D I T I O N A L

P A R A M E T E R S

LEAD, TR (MG/L AS PB)

.10

IRON, TR (MG/L AS FE)

18.

CADMIUM, TR (MG/L AS CD)

.018

COPPER, TR (MG/L AS CU)

.32

ZINC, TR (MG/L AS ZN)

1.9

MANGANESE, TR (MG/L AS MN)

.99

ARSENIC, TR (MG/L AS AS)

.34

SILVER, TR (MG/L AS AG)

&lt; 0.01

REMARKS: BOULDER BATHOLITH 0662

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER  
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 (M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 05 SAMPLER OP HANDLING 3200 ANALYST KEV LAB WQ8H  
 COMPLETED 07-31-77 COMPUTER RUN 08/29/77 DATA 0975/PROG 0876 FUND 0662  
 STND DEV. ION BALANCE 9.99 CA MG NA K CL SO4 HCO3 CO3 NO3  
 SEGMENT MPDES 0.0 0.0 0.0 0.0 0.0100.0 0.0 0.0 0.0  
 CALC. MEQ/L= INSUFFICIENT DATA 77W108



HELENA, MONTANA 59601

SAMPLING SITE: GREGORY MINE

CATIONS		ANIONS	
mg/l	meq/l	mg/l	meq/l
Ca	0.0	Ca	0.0
Mg	0.0	Mg	0.0
Na	0.0	Na	0.0
K	0.0	K	0.0
Fe	0.0	Fe	0.0
Mn	0.0	Mn	0.0
Zn	0.0	Zn	0.0
Cu	0.0	Cu	0.0
Pb	0.0	Pb	0.0
Al	0.0	Al	0.0
Si	0.0	Si	0.0
CO <sub>3</sub>	0.0	CO <sub>3</sub>	0.0
HCO <sub>3</sub>	0.0	HCO <sub>3</sub>	0.0
Cl	0.0	Cl	0.0
NO <sub>3</sub>	0.0	NO <sub>3</sub>	0.0
SO <sub>4</sub>	0.0	SO <sub>4</sub>	0.0
PO <sub>4</sub>	0.0	PO <sub>4</sub>	0.0
SiO <sub>2</sub>	0.0	SiO <sub>2</sub>	0.0
TOC	0.0	TOC	0.0
TDS	0.0	TDS	0.0
Hardness	0.0	Hardness	0.0
Alkalinity	0.0	Alkalinity	0.0
Acidity	0.0	Acidity	0.0
pH	0.0	pH	0.0
Electrical Conductivity	0.0	Electrical Conductivity	0.0
Specific Gravity	0.0	Specific Gravity	0.0
Viscosity	0.0	Viscosity	0.0
Surface Tension	0.0	Surface Tension	0.0
Interfacial Tension	0.0	Interfacial Tension	0.0
Wettability	0.0	Wettability	0.0
Adsorption	0.0	Adsorption	0.0
Desorption	0.0	Desorption	0.0
Permeability	0.0	Permeability	0.0
Porosity	0.0	Porosity	0.0
Capillary Pressure	0.0	Capillary Pressure	0.0
Relative Permeability	0.0	Relative Permeability	0.0
Relative Retention	0.0	Relative Retention	0.0
Relative Saturation	0.0	Relative Saturation	0.0
Relative Viscosity	0.0	Relative Viscosity	0.0
Relative Permeability Index	0.0	Relative Permeability Index	0.0
Relative Retention Index	0.0	Relative Retention Index	0.0
Relative Saturation Index	0.0	Relative Saturation Index	0.0
Relative Viscosity Index	0.0	Relative Viscosity Index	0.0
Relative Permeability Ratio	0.0	Relative Permeability Ratio	0.0
Relative Retention Ratio	0.0	Relative Retention Ratio	0.0
Relative Saturation Ratio	0.0	Relative Saturation Ratio	0.0
Relative Viscosity Ratio	0.0	Relative Viscosity Ratio	0.0
Relative Permeability Index Ratio	0.0	Relative Permeability Index Ratio	0.0
Relative Retention Index Ratio	0.0	Relative Retention Index Ratio	0.0
Relative Saturation Index Ratio	0.0	Relative Saturation Index Ratio	0.0
Relative Viscosity Index Ratio	0.0	Relative Viscosity Index Ratio	0.0
Relative Permeability Ratio Ratio	0.0	Relative Permeability Ratio Ratio	0.0
Relative Retention Ratio Ratio	0.0	Relative Retention Ratio Ratio	0.0
Relative Saturation Ratio Ratio	0.0	Relative Saturation Ratio Ratio	0.0
Relative Viscosity Ratio Ratio	0.0	Relative Viscosity Ratio Ratio	0.0
Relative Permeability Index Ratio Ratio	0.0	Relative Permeability Index Ratio Ratio	0.0
Relative Retention Index Ratio Ratio	0.0	Relative Retention Index Ratio Ratio	0.0
Relative Saturation Index Ratio Ratio	0.0	Relative Saturation Index Ratio Ratio	0.0
Relative Viscosity Index Ratio Ratio	0.0	Relative Viscosity Index Ratio Ratio	0.0
Relative Permeability Ratio Ratio Ratio	0.0	Relative Permeability Ratio Ratio Ratio	0.0
Relative Retention Ratio Ratio Ratio	0.0	Relative Retention Ratio Ratio Ratio	0.0
Relative Saturation Ratio Ratio Ratio	0.0	Relative Saturation Ratio Ratio Ratio	0.0
Relative Viscosity Ratio Ratio Ratio	0.0	Relative Viscosity Ratio Ratio Ratio	0.0
Relative Permeability Index Ratio Ratio Ratio	0.0	Relative Permeability Index Ratio Ratio Ratio	0.0
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Relative Saturation Index Ratio Ratio Ratio	0.0	Relative Saturation Index Ratio Ratio Ratio	0.0
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Relative Permeability Ratio Ratio Ratio Ratio	0.0	Relative Permeability Ratio Ratio Ratio Ratio	0.0
Relative Retention Ratio Ratio Ratio Ratio	0.0	Relative Retention Ratio Ratio Ratio Ratio	0.0
Relative Saturation Ratio Ratio Ratio Ratio	0.0	Relative Saturation Ratio Ratio Ratio Ratio	0.0
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Relative Saturation Index Ratio Ratio Ratio Ratio Ratio	0.0	Relative Saturation Index Ratio Ratio Ratio Ratio Ratio	0.0
Relative Viscosity Index Ratio Ratio Ratio Ratio Ratio	0.0	Relative Viscosity Index Ratio Ratio Ratio Ratio Ratio	0.0
Relative Permeability Ratio Ratio Ratio Ratio Ratio Ratio	0.0	Relative Permeability Ratio Ratio Ratio Ratio Ratio Ratio	0.0
Relative Retention Ratio Ratio Ratio Ratio Ratio Ratio	0.0	Relative Retention Ratio Ratio Ratio Ratio Ratio Ratio	0.0
Relative Saturation Ratio Ratio Ratio			

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ADDITIONAL PARAMETERS

COPPER, TR (MG/L AS CU)	1.00	LEAD, TR (MG/L AS PB)	.14
ZINC, TR (MG/L AS ZN)	21.75	MERCURY, TR (MG/L AS HG)	< .0002
IRON, TR (MG/L AS FE)	14.03	MANGANESE, TR (MG/L AS MN)	29.75
PH, FIELD (SU)	5.0	ANTIMONY TR (mg/l 1958)	< 0.2
TIN, TR (MG/L AS SN)	< 0.8		

PLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVLENTS PER LITER  
~~L=CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED~~  
 )= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

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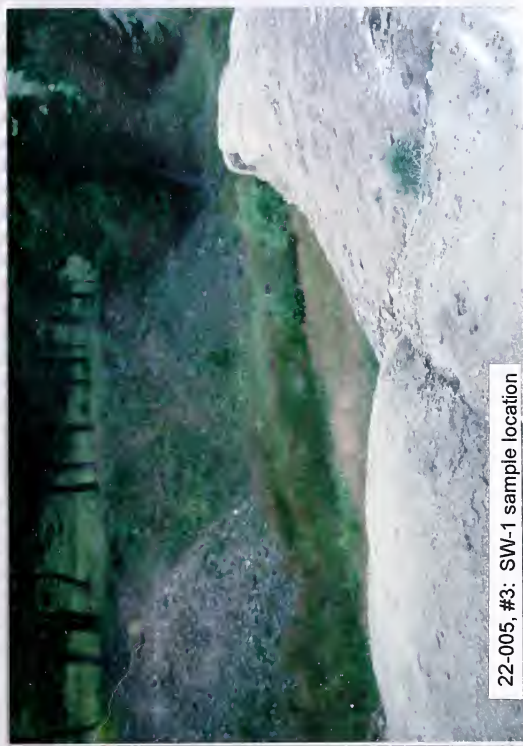
MPL# NO AML01      SAMPLE#  BAM      HANDLING 11      ANALYST  CB      LAB  WQSH
MPL#TED 11-07-79   COMPUTER RUN 11/28/79  DATA 0975/PROG 0876 FUND 6150
NO DEV. ION BALANCE 0.00      CA  MG  NA  K  CL  SO4  HCO3  CO3  NO3
GMENT      MPDES      0.0  0.0  0.0  0.0  33.3  33.3  0.0  33.3  0.0
LC. MEQ/L= INSUFFICIENT DATA
                                     79W2293

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22-005, #1: SW-3 sample location



22-005, #3: SW-1 sample location

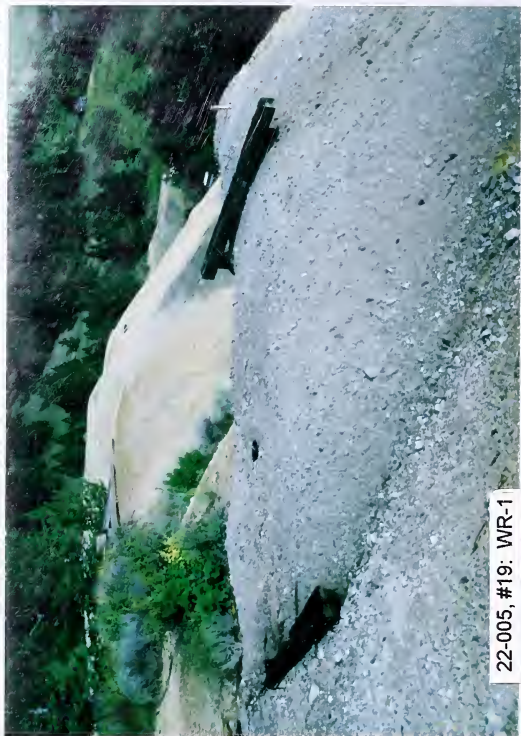


22-005, #0: TP-1 and WR-4



22-005, #2: TP-2A and TP-2B





22-005, #19: WR-1



22-005, #21: WR-3



22-005, #4: SW-2 sample location



22-005, #20: Shaft





22-005, #22: WR-2



22-005, #23: SW-5 sample location



22-005, #24: SW-4 sample location



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: WASHINGTON PA#: 22-007

Date: August 16, 1993 Time: 0852-1600

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Partly cloudy; approx. 60°F;  
scattered showers; slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): No photos taken  
due to camera malfunction. Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Observed: N/A

General Comments on Potential Remedial Alternatives: Incorporation  
into the Montana Tunnels active permit area.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): WASHINGTON PA#: 22-007

Legal Description: T 7N ; R 4W ; Sec. 17 , SW 1/4 NW1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 21' 39" Longitude: W 112° 08' 14"

Primary Drainage Basin and Code: Prickly Pear Creek/10030101

Secondary Drainage Basin: Spring Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Montana Tunnels Mining, Inc., P.O. Box 176, Jefferson City, MT 59638. (406) 933-8314.

Relationship to other mines/sites in the area/district: Pegasus Gold Corporation is interested in acquiring this property for expansion of the Montana Tunnels Project.

Regulatory Status (Activity by other agencies)? Hardrock permits?      
Past Reclamation Activities? N/A

General site features: Elevation 6000' , Slope 5°-15° ,  
Aspect Southeast

Land use: Mining X , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 4.5 acres.  
Dimensions: 1700 feet long along drainage which varies from 100 to 300 feet wide.

Predominant vegetation types: Douglas fir, aspen, willow

Access: roads - good X , poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Mine is located in the headwaters of a small tributary to Spring Creek. Site is underlain by andesite which has been intruded by a rhyolite dike. Mineralization occurs in the dike.

Mining/milling history, ore type/tenor, host rock, gangue: Vein was located prior to 1890 and worked extensively until 1945. Production from 1902 to 1951 inclusive is reported as 11,651 oz. Au, 1,344.082 oz Ag, 543,770 lbs. Cu, 14,509,148 lbs. Pb, and 8,044,639 lbs. Zn from 182,601 tons of ore. Ore minerals included galena, sphalerite, chalcopyrite, tetrahedrite, arsenopyrite, and pyrite.

#### Mine Operation?

Shafts - Yes X, No    , # 1, Comment Reported in literature, but not observed  
Adits - Yes X, No    , # 3, Comment Caved  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three questions:

Period(s) of Operation: Recorded operation was from 1922 to 1945

Origin of Ore Milled - Custom Mill     Dedicated Mill X; Number and names of mines that supplied mill feed: Assumed to be dedicated; no reports of acceptance of ore from other mines.

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Likely a floatation mill, although not specified in the literature. Reported as a 140-ton mill.

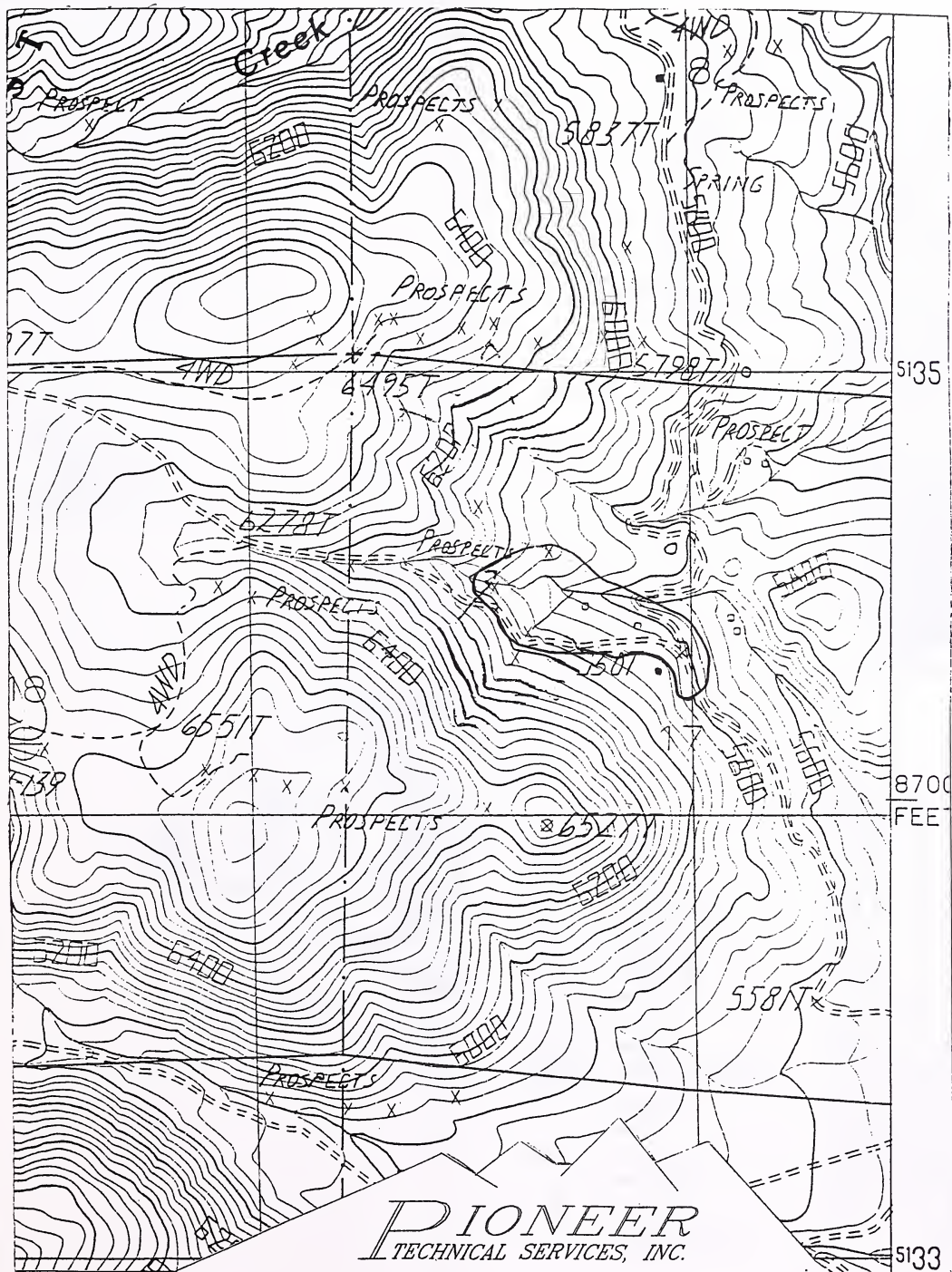


Montana Bureau of Mines and Geology  
Water Well Log Data

11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55790	07N 04W 07 DA	193.0	100.0	6.00
M:5431	07N 04W 08 BDBB	268.2	0.0	18.91
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:5435	07N 04W 16 ACCA	53.1	0.0	39.15
M:5436	07N 04W 16 BBAA	48.7	0.0	26.57
M:5437	07N 04W 16 CDBB	298.7	0.0	66.05
M:5438	07N 04W 16 DBAA	93.1	0.0	73.42
M:5439	07N 04W 16 DBDA	124.0	0.0	113.92
M:5440	07N 04W 16 DCAA	233.0	0.0	15.61
M:55799	07N 04W 21 AAB	65.0	40.0	34.00 (1)
M:122591	07N 04W 21 AAC	350.0	3.0	65.00 (2)





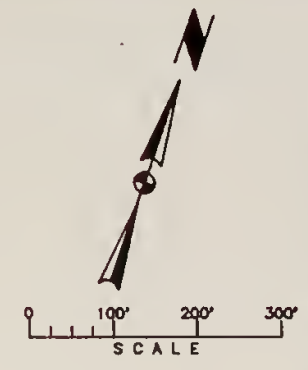
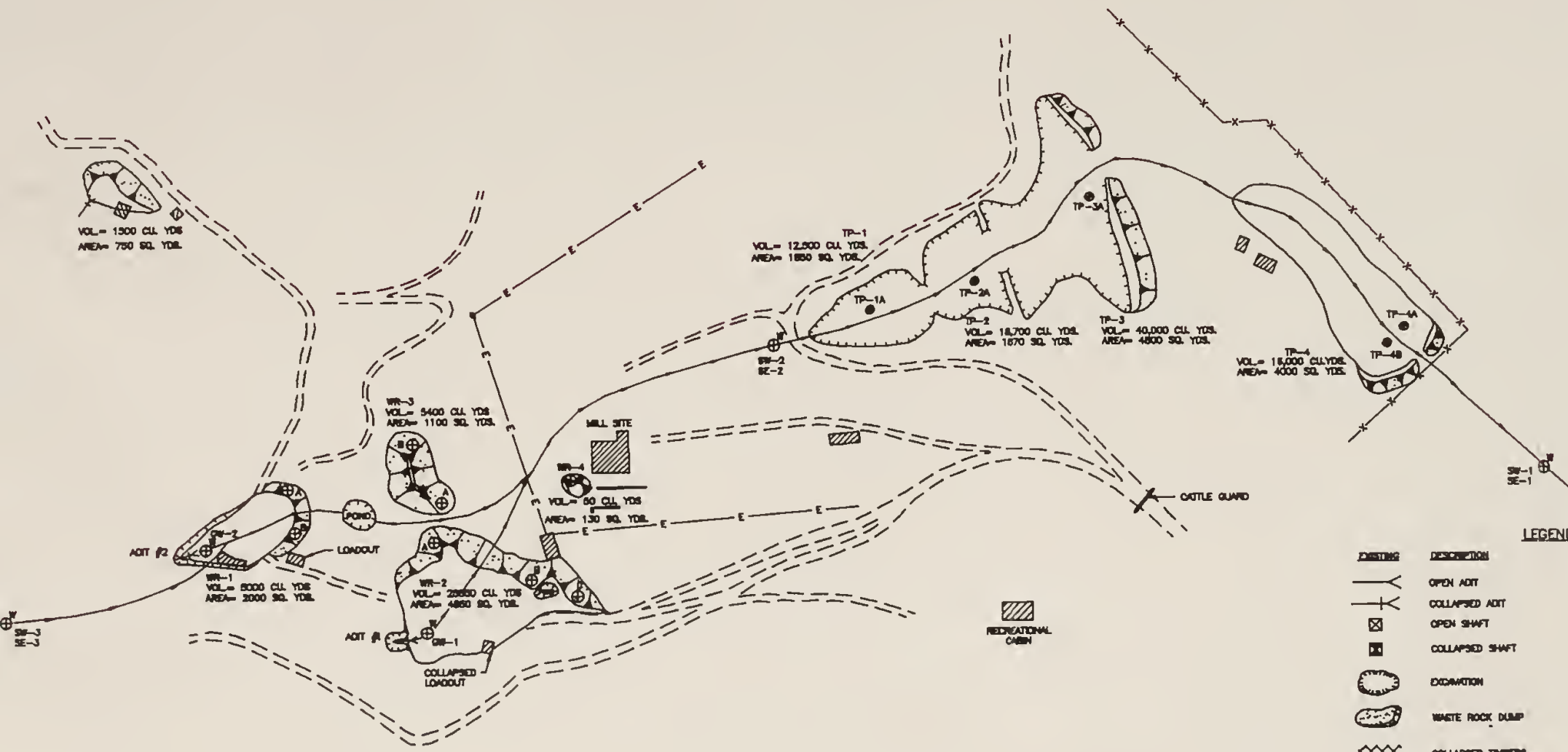
**PIONEER**  
TECHNICAL SERVICES, INC.

WASHINGTON, P.A. NO. 22-007

T07N, R04W, SECTION 17

SCALE: 1" = 1000'





EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING OR BUILDING RUINS
	SOIL SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE		EDGE OF ASPHALT
	GROUND AND SURFACE DRAINAGE		EDGE OF GRAVEL
	WATER WELL		SLOPE DIRECTION
			POWER LINE (OVERHEAD)

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
WASHINGTON MINE PA# 22-007  
COLORADO DISTRICT JEFFERSON COUNTY

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON



DRAWN: MWC DATE: 9/93  
DESIGNED: TDR JOB NO.: 93-17  
APPROVED: F.B. NO.





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay):  
Tailings in lower portions of ponds contained approx. 20% clay, but  
tailings were primarily made up of silty sand.

Determine tailings impoundment depth and describe stratification of the  
tailings if observable (based on texture and color): Tailings impoundments ranged  
from 30 to 50 feet deep; first 10 feet primarily oxidized orange  
material, reduced zone of gray tailings below.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments):  
Tailings are primarily moist to wet.

Describe condition of the tailings impoundment (Note condition of dams or structures,  
location of breaches): All impoundments have been severely breached.

Comments on potential for mitigation: Reprocess or dispose of tailings  
at the Montana Tunnels facility.

# SOURCE INVENTORY FORM

SAMPLERS: Bullock, Pierson\*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME yd <sup>3</sup>	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A-A	TAIL	12,500	Upper pond, north of stream near center; profile, 0'-5'	Breached impoundment	5.7 (D)	0.04	22-007-TP-1	08/16/93 1200	T-Metals, ABA
TP-1A-B	TAIL		Upper pond, north of stream near center; profile, 5'-15'	Breached impoundment	< 3.5 (D)	0.04			
TP-1A-C	TAIL		Upper pond, north of stream near center; profile, 15'-25'	Breached impoundment	< 3.5 (D)	0.05			
TP-2A-A	TAIL	18,700	Second pond, south of stream near center; profile, 0'-5'	Breached impoundment	< 3.5 (D)	0.05			
TP-2A-B	TAIL		Second pond, south of stream near center; profile, 5'-12'	Breached impoundment	< 3.5 (D)	0.04			
TP-2A-C	TAIL		Second pond, south of stream near center; profile, 12'-20'	Breached impoundment	< 3.5 (D)	0.05			
TP-2A-D	TAIL		Second pond, south of stream near center; profile, 20'-28'	Breached impoundment	< 3.5 (D)	0.04			
TP-3A-A	TAIL	40,000	Third pond, south of stream east edge; borehole, 0'-3', brown sand	Breached impoundment	< 3.5 (D)	0.05			
TP-3A-B	TAIL		Third pond, south of stream east edge; borehole, 3'-11', brown/orange/gray silty sand	Breached impoundment	< 3.5 (D)	0.05			
TP-3A-C	TAIL		Third pond, south of stream east edge; borehole, 11'-15', orange/gray silty sand	Breached impoundment	< 3.5 (D)	0.06			
TP-4A-A	TAIL	15,000	Lowest pond, north edge near center; profile, 0'-3'	Breached impoundment	< 3.5 (D)	0.05	22-007-TP-2	08/16/93 1210	T-Metals, ABA
TP-4A-B	TAIL		Lowest pond, north edge near center; profile, 3'-10'	Breached impoundment	< 3.5 (D)	0.05			
TP-4A-C	TAIL		Lowest pond, north edge near center; profile, 10'-15'	Breached impoundment	< 3.5 (D)	0.04			
TP-4B-C	TAIL		Lowest pond, south side; profile, 15'	Breached impoundment	< 3.5 (D)	0.04			

\*Blank reading (empty Meter); S-Included Data (Onion Meter)

Comments or deviations from SOPs: 22-007-TP-1 is composite of TP-1A-A through -1A-C, TP-2A-A through -2A-D, and TP-3A-A through -3A-C. 22-007-TP-2 is composite of TP-4A-A through -4A-C and TP-4B-C.

\*Continued on next page



**SAMPLERS:** Pierson

[illegible]

D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-007-WR-1 is composite of WR-1A and -1B, and WR-2A through -2C. 22-007-WR-2 is composite of WR-3A and -3B, and WR-4.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 2 Identification: Adit #1 and Adit #2; both sampled

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number:      Identification: Seeps in the intermittent drainage above the mine site.

Groundwater wells within 5 miles?: Yes X, No     ;  
Number of well logs: 34

Distance to nearest well used for drinking? Approximately 0.9 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Tailings appear to be in contact with groundwater at some locations and are reactive (low pH).

Other observations/notes: N/A

**SAMPLERS:** Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from edit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Spring Creek; majority of flow from adit discharge.

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes X, No     , Name(s)/Description: Water from unnamed tributary ponds between WR-1 and WR-2.

Waste materials within any floodplain: Yes X, No      Source ID(s):       
All waste rock and tailings are within floodplain.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)?     

High Flow: 5 cfs, Average Flow: < 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Stream runs over or through all waste rock and tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, wetlands, recreation

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? <1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):       
Sedimentation in stream bed. Mine waste and elevated metals concentration in sediments for at least 1000 feet below TP-4. pH in water above mine is low indicating the possibility of upgradient impacts.



**SAMPLERS:** Bullock, Belanger

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 5 acres below TP-4

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes X, No     , Describe: Parent material contains some carbonate based rocks.

### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100 X;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? One recreational cabin approximately  
200 yds from minesite.

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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**SAMPLERS: Bullock, Belanger, Pierson**  
**ACID DRAINAGE/AIR PATHWAY INVENTORY FORM**

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIFE)	MOISTURE CONTENT (WT/DRT/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/NO DEBRIS/LOW/NONE)
TP-1	Low pH; sulfides	Partial	16,650	16,650	Yes	Moderate
TP-2	Low pH; sulfides	Partial	16,830	16,830	Yes	Moderate
TP-3	Low pH; sulfides	Partial	43,200	43,200	Yes	Moderate
TP-4	Low pH; sulfides	Partial	36,000	36,000	Yes	Moderate
WR-1	Low pH; sulfides	Partial	18,000	18,000	Yes	Low
WR-2	Low pH; sulfides	Partial	43,650	43,650	Yes	Low
WR-3	Low pH; sulfides	Partial	9,900	9,900	Yes	Low
WR-4	None	Partial	1,170	1,170	Yes	Low
Adit #1	FEOX	N/A	N/A	N/A	N/A	N/A
Adit #2	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No     ,  
Describe: Pegasus Gold Corporation has Montana Tunnels Project workers.

Population within 1 mile: 1-10 X; 10-30     ; 30-100     ; 100-300     ;  
300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ;  
Comments     

Evidence of recreational use on site: Yes X, No     , Describe: Off-  
road vehicle tracks

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
Wilderness Area -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
T&E Species Habitat -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
Bat Habitat -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>

Primary Drainage     ; Secondary Drainage X; No Information     :

Riparian Habitat Quality - High     , Medium X, Low       
Wetlands Frontage - High     , Medium X, Low       
Fisheries Habitat and Species Classification -      3  
Sport Fishery Classification - Not Rated

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes     , No X, Number     , types and locations:     

Hazardous structures: Yes X, No     , Number 3, types and locations:       
Cabin, loadout, and mill

Unstable highwalls, pits, trenches, slopes: Yes     , No X, Number     ,  
types and locations:     

Unstable waste piles, impoundments, undercut banks: Yes X, No     ,  
Number All, types and locations: All waste rock piles and tailings  
impoundments

Fire and/or Explosion hazards: Yes     , No X, Explain:



## Bibliography

- MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 44 and 52.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/WQB, Analytical Data for Washington Mine, June 7, 1977 and September 12, 1979.
- MDSL/AMRB Files, Abandoned Mine National Portal Inventory Sheet, Phase II Problem Area Data Form for Washington, Prepared by Mark Carlstrom and Ben Mundie, September 11, 1979.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Washington, Prepared by Delta Engineering, Date Unknown.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Washington, Prepared by Northern Engineering and Testing, July 11, 1988.
- USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

WASHINGTON  
PA NO. 22-007



Washington PA# 22-007  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-007-SE-1	5100	28.4	32.7 J	7.2	8.6	156	46400	0.084	3210	9	2280	34	5080	NR
22-007-SE-2	44	29.9	2.6 J	12.6	32.6	33.6	22900	0.028 U	2770 J	21	133	6 U	184	NR
22-007-TP-1	9180 J	20.8 J	31.9 J	13.2 J	7.6 J	293 JX	95700 J	0.207	2770 J	19 J	5830 J	43	5660 JX	NR
22-007-TP-2	11000 J	13.3 J	68.9 J	17.7 J	19.9 J	280 JX	101000 J	0.08	6360 J	24 J	4310 J	6 U	10700 JX	NR
22-007-WR-1	2410	26.6	16.4 J	5.6	7.9	53.8	30900	0.384	1470	6	2330	16	2970	NR
22-007-WR-2	3250	24.1	20.8 J	4.3	3.9	67.2	33700	0.39	987	6	4420	19	3010	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR 1/1000	SULFUR ACID BASE POTENT. 1/1000
22-007-TP-1	11.7	366	47.5	-318	<0.01	10.2	1.65	319	-271
22-007-TP-2	10.6	331	124	-207	<0.01	10.8	2.35	337	-213
22-007-TP-2DUP	10.3	322	124	-199	<0.01	10.8	2.38	337	-214
22-007-WR-1	4.89	153	48.6	-104	0.10	1.38	3.41	43.1	5.54
22-007-WR-2	4.13	129	29.0	-100	2.39	0.41	1.33	12.8	16.2

WATER MATRIX ANALYSES

Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)	HARDNESS CALC.
22-007-GW-1	621	21.2	2.57 U	9.7 U	9.57 J	2.03	3660 J	0.260 J	1740 JX	12.7 U	2.35	30.7 U	336	245
22-007-GW-2	172	21.5	2.57 U	10.6	6.83 U	3.3	17700 J	0.160 J	3630 JX	12.7 U	4.27	30.7 U	2230	367
22-007-SW-1	1060	12.8	36.2	9.7 U	6.83 U	56.9 J	7310	0.140	5130	33.5	471	32.7	10900	478
22-007-SW-2	59.3	9.87	32.7	9.7 U	6.83 U	13.5 J	950	0.120 U	4090	28	2.51	30.7 U	9980	438
22-007-SW-3	2.43	78.1	27.3	9.7 U	6.83 U	58.8 J	55.7	0.120 U	982	27.8	3.26	30.7 U	3920	162

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-007-GW-1	343	< 5.0	132	< 0.05	NR
22-007-GW-2	512	< 5.0	318	< 0.05	NR
22-007-SW-1	776	5.0	498	< 0.05	NR
22-007-SW-2	712	< 5.0	1140	< 0.05	NR
22-007-SW-3	325	< 5.0	193	< 0.05	NR

LEGEND

- SE1 - In stream approx. 300' downgradient of tailings pond 4.  
SE2 - Between tailings and waste rock at road.  
TP1 - Composite of subsamples TP1A-A through 1A-C, 2A-A through 2A-D, and 3A-A through 3A-C.  
TP2 - Composite of subsamples TP2A-A through 4A-C, and 4B-C.  
WR1 - Composite of subsamples WR1A, 1B, and 2A through 2C.  
WR2 - Composite of subsamples WR2A, 3B, and 4.  
TP2DUP - Duplicate of the 22-007-TP-2 sample.  
BACKGROUND - From the Bertha Mine (22-002-SS-1).
- GW1 - Discharge from add #1.  
GW2 - Discharge from add #2.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Upgradient of site approx. 200 feet.



**XRF ANALYSIS RESULTS**

**WASHINGTON  
PA NO. 22-007**





## XRF Field Analyses

Results in PPM

Page 1 of 2.

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-007-SE-1000		15990	20285.2	1497.93		4507.65	42441.6		153.622 *	3276.46	5467.68	257.081
22-007-SE-500		18150.3	24546.8	1448.52		5575.82	44852.9		105.236 *	3655.54	5634.43	180.18
22-007-TP1A-A		19324.7	47425.2	1757.79		6149.13	44173.4		329.182	7475.85	6637.19	93.7574
22-007-TP1A-B		15235.1	22700	1183.68		5597.08	74611.8		240.311	11013.7	16207.5	49.549
22-007-TP1A-C		15106.1	46476.4	1498.42		6279.61	57711.7		214.465 *	8013.02	9891.02	83.4078
22-007-TP2A-A		21647.3	31986.3	1810.36		396.209 *	60992.7		177.403 *	833.889	2171.78	146.917
22-007-TP2A-B		14830.7	15650.9	1554.61		1117.67 *	71659.5		249.211	2457.35	6203.21	39.6429
22-007-TP2A-C		18257	32372.3	1835.55		688.978 *	25223.4		109.996 *	935.184	3719.37	76.8147
22-007-TP2A-D		12192.6	12577.9	1253.46		1469.77	73550.4		210.967 *	2878.66	8979.13	54.726
22-007-TP3A-A		17145.9	32260.8	1645.29		7090.55	68886.9		330.109	7403.39	11793.1	107.281
22-007-TP3A-B		23892.9	50211.8	1690.08		14656.7	66892.3		160.002 *	5144.35	5184.69	87.0671
22-007-TP3A-C		18894.8	70854	1771.12		12767.3	67640.1		242.243	4079.36	7116.49	176.241
22-007-TP4A-A		20133.8	10793.4	1472.58		2344.51	57497.1		180.563 *	3590.85	5659.22	75.9294
22-007-TP4A-B		16603	28558	1458.79		7084.22	68665.6		282.271	8277.61	7049.91	88.4666
22-007-TP4A-C		14556.6	49767.2	1421.67		10146	67521.8		195.73 *	8977.53	7441.77	109.637
22-007-TP4B-C		11182.1	76464.4	1156.53		9877.57	62154.8		123.642 *	4971.27	6341.75	160.558
22-007-TP-1-COMP		18111.2	30511.5	1764.65		2796.05	58111.4		182.395 *	3716.26	6335.98	70.6058
22-007-TP-2-COMP		13282.5	30827.1	1201.82		6304.86	59888.4		129.096 *	6106.58	6037.88	87.9691
22-007-WR1-A		10198	30109	1803.2		2081.5	43346.3		88.0137 *	299.752	139.149 *	161.832
22-007-WR1-B		17263.1	23157.1	1596.14		556.2 *	53183.8		1027.65	466.602	8986.22	75.9034
22-007-WR2-A		8871.64	28912.8	547.427		513.622 *	60812.2		191.21 *	1200.58	38074.8	122.775
22-007-WR2-B		15095.7	18746.8	1745.16		2122.54	34149.4		123.226 *	1833.67	1437.96	356.541
22-007-WR2-C		3359.05	16317.7	790.071		39049.2	145785		70.9904 *	956.056	7347.05	135.316
22-007-WR3-A		14042.2	32355.9	1309.33		954.317 *	82305.8					
22-007-WR3-B		14697.5	32996.4	764.221		3898.49	23918.3					
22-007-WR-1-COMP		8815.97	20939.6	745.095		8310.3	70746.3		346.013	9084.18	17640.7	138.88
22-007-WR-2-COMP		14780.5	38120.2	1002.15		2002.84	56282.3		59.9881 *	2996.01	4177.35	160.453
22-007-WR-4		14016.9	50203.5	1395.93		1796.02	64500		149.088 *	1888.37	4622.16	177.129

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-007-SE-1000	126.628			1899.76	173.11			489.758			
22-007-SE-500	109.013			1851.81	156.967				130.386 *		
22-007-TP1A-A	119.85			1817.73	192.755	170.978 *	79.3424 *	220.289			
22-007-TP1A-B	88.0321			3826.9	125.161	252.384 *	106.92 *	128.417			
22-007-TP1A-C	90.8785			3749.62	142.227	211.025 *	111.239 *	158.41			
22-007-TP2A-A	134.196			6784.6	167.737		289.78	224.733			
22-007-TP2A-B	99.5993			4353.44	147.624		133.089 *	147.247	137.863 *		
22-007-TP2A-C	132.961			3954.43	209.025		126.407 *	219.826	97.2418 *		
22-007-TP2A-D	97.5504			5204.4	165.762		105.143 *	141.292	233.886 *		
22-007-TP3A-A	102.245			3334.99	158.261		143.139 *	277.524			
22-007-TP3A-B	100.39			1891.44	176.115			262.701		9.79454 *	
22-007-TP3A-C	107.732			1931.7	148.942	208.89 *		210.002	188.182 *		
22-007-TP4A-A	149.474			3071.51	244.948		60.1766 *	319.32			
22-007-TP4A-B	111.853			3260.01	174.929			221.673	182.403 *		
22-007-TP4A-C	93.898			2891.09	147.29		86.283 *	185.91	130.027 *		
22-007-TP4B-C	81.1212			1928.1	127.83			154.124	123.382 *		
22-007-TP-1-COMP	109.423			3965.68	165.839		150.221 *	177.549			
22-007-TP-2-COMP	87.825			2569.44	144.589		87.257 *	175.463	121.498 *		
22-007-WR1-A	136.281			265.086	91.9406			415.624			12.2032 *
22-007-WR1-B	161.455			8090.01	251.288			209.122	198.26 *		
22-007-WR2-A	87.5998			15271.4	137.101		1086.82		203.769 *		
22-007-WR2-B	140.767			1657.26	157.136		224.717 *	102.954 *			20.1644 *
22-007-WR2-C	73.6002			6213.97	47.2393 *	633.227 *	69.6279 *	596.814			12.641 *
22-007-WR3-A	135.978			4335.34	218.88		73.0882 *	283.788	136.85 *		
22-007-WR3-B	110.391			466.5	198.288			737.538		11.1618 *	
22-007-WR-1-COMP	108.262			9576.65	133.546		231.605 *	248.873	236.326 *		
22-007-WR-2-COMP	130.321			3154.68	202.531		103.871 *		114.775 *	12.0111 *	
22-007-WR-4	118.435			4750.13	166.4			398.739	117.642 *		

\* - Estimated Quantity  
\$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

WASHINGTON  
PA NO. 22-007



# **AIMSS SCORESHEET**

SITE NAME:

WASHINGTON

PA NUMBER:

22-007

LINE  
NO.

## **GROUNDWATER PATHWAY**

1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	733.828
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		32
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	37.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>10860654</b>

## **SURFACE WATER PATHWAY**

11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	764.502
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18	SW - TARGETS	WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	23
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>14066837</b>

## **AIR PATHWAY**

25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.212
29		POPULATION - 4 MILES		30
30	AIR - TARGETS	NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	50
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>63180</b>

## **DIRECT CONTACT PATHWAY**

36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.042
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	13
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>34155</b>

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE  
(LINES 10 + 24 + 35 + 44) / 100,000

250.25

		SITE NAME:		WASHINGTON
		PA NUMBER:		22-007
LINE NO.	SITE SAFETY			
1	THREAT	ACCESSIBILITY		20
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	120
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8			HAZARDS SCORE	SUM LINES 2 - 7
9	TARGETS	POPULATION - 1 MILE		1
10		NEAREST RESIDENCE		10
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	13
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	31.20



**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**



STATE	MONTANA	COUNTY	JEFFERSON
LAT.-LONG.	462138N 112 750W	SAMPLE LOCATION	7N 4W 178DA
STATION CODE		ANALYSIS NUMBER	77W1078
DATE SAMPLED	06-07-77	DRAINAGE BASIN	0411 -U MISSOURI
TIME SAMPLED	1115	WATER FLOW RATE	50. GPM(E)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE	UNUSED	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

## SAMPLING SITE: SEEP FROM WASHINGTON MINES

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE (HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	200.	4.164
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE (PO4 AS P)		
ALUMINUM (AL)			NO3+NO2 (TOT AS N)		

SUM CATIONS	0.0	0.0	SUM ANIONS	200.000	4.164
-------------	-----	-----	------------	---------	-------

LABORATORY PH	7.20	TOT HARDNESS (MG/L-CAC03)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CAC03)	
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	654.0	SODIUM ADSORPTION RATIO	

A D D I T I O N A L		P A R A M E T E R S	
LEAD, TR (MG/L AS PB)	< 0.05	IRON, TR (MG/L AS FE)	5.9
CADMIUM, TR (MG/L AS CD)	.005	COPPER, TR (MG/L AS CU)	< 0.01
ZINC, TR (MG/L AS ZN)	3.1	MANGANESE, TR (MG/L AS MN)	2.9
ARSENIC, TR (MG/L AS AS)	.18	SILVER, TR (MG/L AS AG)	< 0.01

REMARKS: BOULDER BATHOLITH 0662 RADIOACTIVITY SAMPLE MINE SEEP REACH  
ES SPRING CREEK

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER  
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
(M)= MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 03 SAMPLER DP HANDLING 3200 ANALYST KEV LAB WQBH  
COMPLETED 07-31-77 COMPUTER RUN 08/29/77 DATA Q975/PROG 0876 FUND 0662  
STND DEV. ION BALANCE 9.99 CA MG NA K CL SO4 HCO3 CO3 NO3  
SEGMENT MPDES 0.0 0.0 0.0 0.0 0.0 0.0 100.0 0.0 0.0 0.0  
CALC. MEQ/L= INSUFFICIENT DATA 77W1078



STATE HEALTH DEPT.		WATER QUALITY BUREAU		HELENA, MONTANA 59601	
STATE MONTANA		COUNTY JEFFERSON			
LAT.-LONG. 462128N 1121015W		SAMPLE LOCATION 7N 5W 13			
STATION CODE		ANALYSIS NUMBER 79W2295			
DATE SAMPLED 09-12-79		DRAINAGE BASIN 0411 -U MISSOURI			
TIME SAMPLED		WATER FLOW RATE 70. GPM(E)			
METHOD SAMPLED GRAB		FLOW MEASUREMENT METHOD FLOAT + TIME			
SAMPLE SOURCE MINE DRAIN		ALTITUDE OF LAND SURFACE			
WATER USE STOCK		TOTAL WELL DEPTH BELOW LS			
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS			
SAMPLED BY DSL		SAMPLE DEPTH BELOW SURFACE			

SAMPLING SITE: WASHINGTON MINE

MG/L	MEQ/L	MG/L	MEQ/L
CALCIUM (CA)		BICARBONATE (HCO3)	
MAGNESIUM (MG)		CARBONATE (CO3)	
SODIUM (NA)		CHLORIDE (CL)	
POTASSIUM (K)		SULFATE (SO4)	
		FLUORIDE (F)	
		PHOSPHATE (PO4 AS P)	
		NO3+NO2 (TOT AS N)	

SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000
LABORATORY PH		TOT HARDNESS (MG/L-CACO3)			
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY (MG/L-CACO3)			
SUM-DISS. IONS MEAS. (MG/L)		LABORATORY TURBIDITY (NTU)			
LAB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO			

ADDITIONAL PARAMETERS			
COPPER, TR (MG/L AS CU)	0.01	LEAD, TR (MG/L AS PB)	< .05
ZINC, TR (MG/L AS ZN)	1.66	MERCURY, TR (MG/L AS HG)	< .0002
IRON, TR (MG/L AS FE)	3.17	MANGANESE, TR (MG/L AS MN)	3.22
PH, FIELD (SU)	4.5	ANTIMONY (TR (MG/L AS SB)	< 0.2
TIN, TR (MG/L AS SN)	< 0.8		

REMARKS: AML

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVALENTS PER LITER  
 CL=CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
 M=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO	AML 03	SAMPLER	BAM	HANDLING	11	ANALYST	DB	LAB	QGBH
COMPLETED	11-07-79	COMPUTER RUN	11/26/79	DATA	0975/PROG 0876	FUND	6150		
TND DEV.	ION BALANCE	0.00	CA	MG	NA	K	CL	SO4	HCO3
SEGMENT	MPDES		0.0	0.0	0.0	0.0	33.3	33.3	0.0
									33.3
									0.0
ALC. MEQ/L= INSUFFICIENT DATA									79W2295

**LABORATORY REPORT**

To: Delta Engineering  
Address: 510 1st Ave. N., Suite 203  
Great Falls, Montana 59401

(1) Lab No.: 88-6445  
Date: 05/26/88 pjf

**WATER ANALYSIS**

Washington Mine - W. Adit  
Sampled 05/06/88 @ 1200  
Submitted 05/10/88

**CONSTITUENT****mg/l**

Specific Conductance @ 25°C -----	916	umhos/cm
pH -----	6.6	s.u.
Calcium -----	148	
Magnesium -----	27	
Sodium -----	8	
Sulfate -----	386	
Total Hardness as CaCO3 -----	479	
Total Alkalinity as CaCO3 -----	131	
Total Suspended Solids -----	43	

**Metals:**

Arsenic -----	0.232
Cadmium -----	0.007
Copper -----	<0.01
Iron -----	26.2
Lead -----	<0.01
Manganese -----	5.48
Mercury -----	<0.001
Zinc -----	3.01

**LABORATORY REPORT**

To: Delta Engineering  
Address: 510 1st Ave. N., Suite 203  
Great Falls, Montana 59401

(1)

Lab No.: 88-6446  
Date: 05/26/88 pjf

**WATER ANALYSIS**

Washington Mine - Lower  
Sampled 05/06/88 @ 1225  
Submitted 05/10/88

**CONSTITUENT****mg/l**

Specific Conductance @ 25°C -----	1240	umhos/cm
pH -----	6.0	s.u.
Calcium -----	206	
Magnesium -----	46	
Sodium -----	8	
Sulfate -----	704	
Total Hardness as CaCO3 -----	701	
Total Alkalinity as CaCO3 -----	2	
Total Suspended Solids -----	70	

**Metals:**

Arsenic -----	3.648
Cadmium -----	0.125
Copper -----	0.15
Iron -----	17.6
Lead -----	0.15
Manganese -----	7.88
Mercury -----	<0.001
Zinc -----	22.9



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ARGENTINE PA#: 22-102

Date: August 16, 1993 Time: 1820-2000

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Overcast; cool

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): No photos taken due to camera malfunction. Video Tape No. 6

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Access to site by truck. Possible exploration in the early 1980's.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study discharge treatment. Grade, amend and revegetate dump material.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ARGENTINE PA#: 22-102

Legal Description: T 7N ; R 5W ; Sec. 2 , SW 1/4 NW 1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 23' 20" Longitude: W 112° 11' 53"

Primary Drainage Basin and Code: Clancy Creek/10030101

Secondary Drainage Basin: South Fork Quartz Creek

USGS Quadrangle map name(s): Chessman Reservoir

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (include address and phone when available): Mascot Silver  
Lead Mines, Inc., Box 660, Kellogg, ID 83837; Helena National  
Forest.

Relationship to other mines/sites in the area/district: None known

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 7400' , Slope 5°-20° ,  
Aspect East

Land use: Mining ☐ , Recreational ☒ , Residential ☐ , Urban ☐ ,  
Agricultural ☒ , Other (Specify) \_\_\_\_\_

Area of disturbed/unvegetated lands? 1-2 acres.  
Dimensions: \_\_\_\_\_

Predominant vegetation types: Lodgepole pine, lupine, and spruce

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .  
Other logistical considerations (proximity to other sites). \_\_\_\_\_

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on the west side of the  
headwaters of South Fork Quartz Creek. Creek flows north away from  
site and then east to confluence with Clancy Creek approximately 5  
miles away.

Mining/milling history, ore type/tenor, host rock, gangue: No  
information available.

Mine Operation?

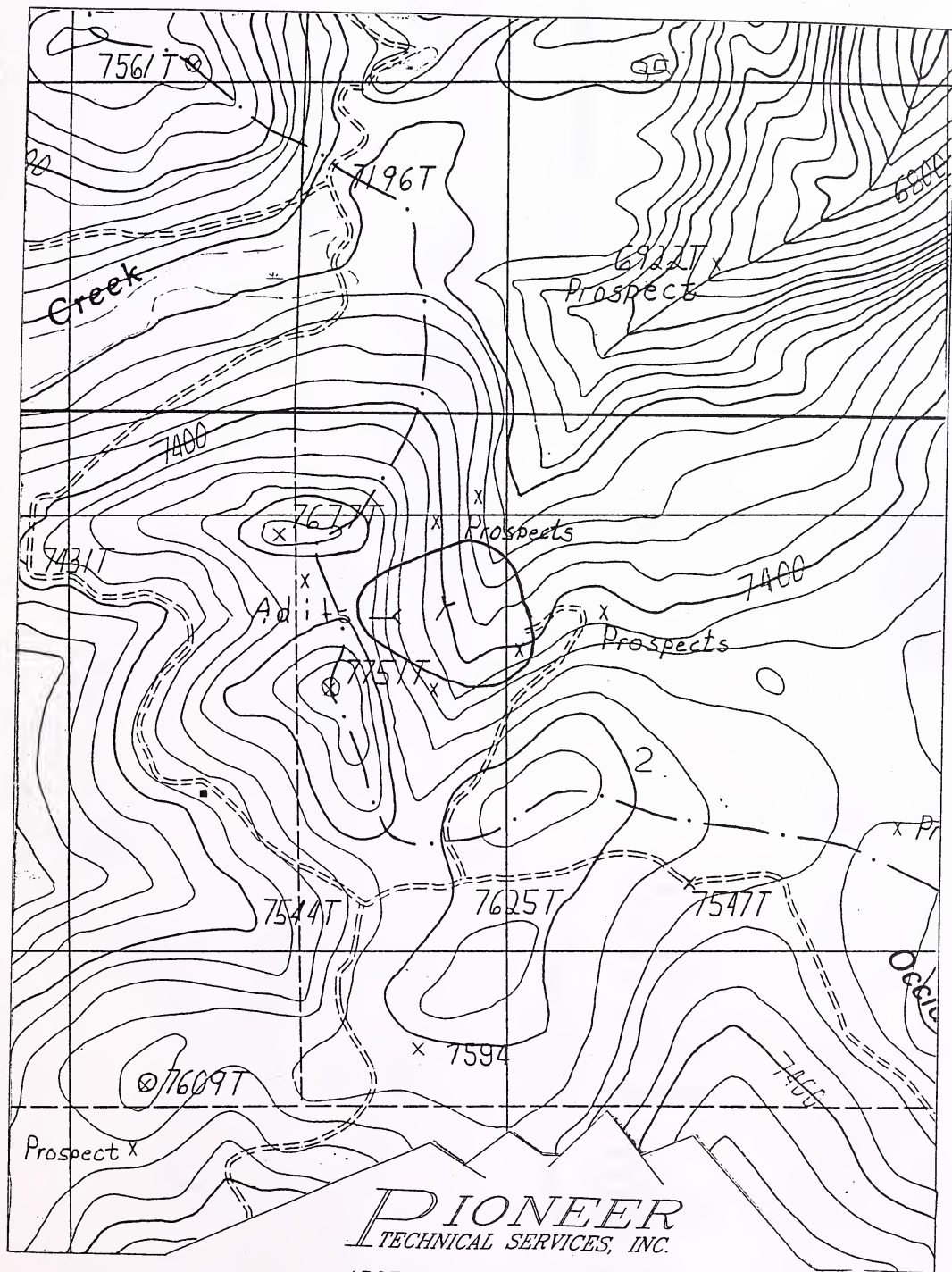
Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 4, Comment 1 flooded; 1 open; 2 caved  
Pits - Yes X, No     , # 1, Comment 40 feet cut face  
Placers - Yes     , No X, #     , Comment       
Other - Yes X, No     , # 3, Comment Trenches

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



**PIONEER**  
TECHNICAL SERVICES, INC.

ARGENTINE, P.A. NO. 22-102

T07N, R05W, SECTION 02

SCALE: 1" = 1000'









## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock, Belanger

[illegible]

D-Direct reading (Galvay Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 22-102-WR-1 is a composite of WR1-B, WR1-C, WR-2B. 22-102-WR-2 is a composite of WR-1A, WR-2A.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 3 Identification: One  
associated with WR-1; one associated with WR-3; and, one with WR-2.

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes     , No X, Number:      Identification:     

Groundwater wells within 4 miles?: Yes X, No     ;  
Number of well logs: 14

Distance to nearest well used for drinking? Approx. 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable     , Possible X, Unlikely     .

Waste rock dumps contain elevated levels of metals.

Other observations/notes: No population centers within a five mile  
radius of the site. Well log count may be attributed to Montana Tunnels  
Project or error in the database.



**SAMPLERS:** Belanger

FLOW: Estimated (E) or Measured (M) from edit, sheet, seen or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Tributary to the South Fork of Quartz Creek

Dry streambeds: Yes    , No X, Name(s):    

Other surface water: Yes    , No X, Name(s)/Description:    

Waste materials within any floodplain: Yes X, No     Source ID(s): WR-1 and WR-3

Approximate Flood frequency?     1 yr,     10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.55 during investigation  
High Flow: 1.0 cfs, Average Flow: 0.1 cfs

Distance between waste source(s) and nearest surface water body (ft)? Approx. 100 feet

Surface water draining onto or through waste sources: Yes X, No    ,  
Describe: Adit discharges drain through WR-1 and WR-3.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Stock watering, fishery, riparian/wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes    ,  
No X, Distance downstream (ft)?     Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):      
Vegetative buffer between waste dumps and stream.

SAMPLERS: Belanger

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 5 acres of gentle to moderately sloping floodplain area.

Wetlands present: Yes X, No   , Describe: Drainage is low gradient and marshy with beaver ponds in the vicinity.

Carbonate rocks/soils: Yes   , No X, Describe: None observed

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10   ; 10-30 X; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments Primarily recreational

Nearest residence(ft or miles)? Approximately 4 miles

For each source (table next page):

Available fine materials?    Surface area?

Uncovered and unvegetated?    Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS:** Bullock, Belanger

## Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Litter; vehicle tracks

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - Not Rated  
Sport Fishery Classification - Not Rated

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Adit associated with WR-2 and WR-3.

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Old cabin

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## **Bibliography**

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Argentine, Prepared by Northern Engineering and Testing, July 28, 1988.

USGS, Topographic Map, Chessman Reservoir, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

ARGENTINE  
PA NO. 22-102



Argentine PA# 22-102  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-102-SE-1	27	41.8	3.4 J	4.1	3.5	34.7	9900	0.04 U	2620	3	449	7 U	439	NR
22-102-SE-2	6 U	13.8	0.7 U	2.5 U	3.4	3.4	5790	0.037 U	146	3 U	35	8 U	30	NR
22-102-WR-1	55.6 J	72.7 J	2.6 J	8.94	6.89	97.3	23000	0.031 U	2540	6.69	785 J	7.54 U	610 J	NR
22-102-WR-2	259 J	22.6 J	8.6 J	3.16	1.47	231	23300	0.055	877	2.41 U	7640 J	5.84 U	1490 J	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000	%	U/1000
22-102-WR-1	0.15	4.69	4.99	-7.1	0.3	0.03	0.04	0.08	0.32	1.25	23.7	3.74	-30.9	
22-102-WR-2	2.43	75.9			-83.	1.35	0.76							

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)	HARDNESS CALC.
22-102-GW-1	1.49 U	2.01 U	7.63	9.7 U	6.83 U	26.5	1050 J	0.190 J	3110 JX	12.7 U	106	30.7 U	729	19.2
22-102-GW-2	1.49 U	16.7	2.57 U	9.7 U	6.83 U	3.27	3190 J	0.120 J	9110 JX	13.8	4.36	30.7 U	3990	415
22-102-SW-1	3.15	5.33	2.77	9.7 U	6.83 U	7.67	138 J	0.140 J	1600 JX	12.7 U	17	30.7 U	385	41.4
22-102-SW-2	2.18	4.8	2.57 U	9.7 U	6.83 U	2.47	66.5 J	0.118 U	7.5 JX	14.5	1.97	30.7 U	8.83	28.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-102-GW-1	79	< 5.0	24	< 0.05	NR
22-102-GW-2	643	< 5.0	338	< 0.05	NR
22-102-SW-1	102	< 5.0	22	< 0.05	NR
22-102-SW-2	72	< 5.0	6	< 0.05	NR

LEGEND

SE1 - Down gradient of site.

SE2 - Up gradient of site.

WR1 - Composite of subsamples WR1B, 1C, and 2B.

WR2 - Composite of subsamples WR1A and 2A.

BACKGROUND - From the Enterprise Mine (22-074-SS-1).

GW1 - Associated with waste rock dump 1.

GW2 - Associated with waste rock dump 3.

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.





**XRF ANALYSIS RESULTS**

**ARGENTINE  
PA NO. 22-102**



Mine Name: Argentina PA# 22-102

## XRF Field Analyses

### Results in PPM

[illegible]

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

ARGENTINE  
PA NO. 22-102





# AIMSS SCORESHEET

SITE NAME:

ARGENTINE

PA NUMBER:

22-102

LINE  
NO.

GROUNDWATER PATHWAY			
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 83.937
6		WELLS - 1 MI. x 2.5	0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	14
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 14.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 470047

SURFACE WATER PATHWAY			
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 600
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 92.236
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	10
19		FISHERY	0
20		RECREATION	0
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22 12
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 664099

AIR PATHWAY			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.920
29		POPULATION - 4 MILES	10
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33 20
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 920

DIRECT CONTACT PATHWAY			
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.837
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 - 42 5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 628

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE  
(LINES 10 + 24 + 35 + 44) / 100,000

11.36

LINE  
NO.

SITE NAME:

ARGENTINE

PA NUMBER:

22-102

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	140
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>14.00</b>

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MINAH PA#: 22-104

Date: July 9, 1993 Time: 1120

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H  
Lasher, Pioneer

Visitors: Mr. Bill Snooty, MT Tunnels Project/  
Pegasus Gold

Weather/Seasonality Observations: Partly cloudy; cool (50°F);  
breezy (5-10 mph); cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #24: Montana  
Tunnels; Minah was located in uppermost cut next to trees.  
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Minah became part of the MT Tunnels Project beginning in 1989.  
Currently, all features are gone, including building, loadout,  
and stack. Discharge from adit has been french drained to MT  
Tunnels tailings pond.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: No  
remediation is necessary; site is gone.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MINAH PA#: 22-104

Legal Description: T 7N ; R 4W ; Sec. 17 , SW 1/4 SW 1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 21' 53" Longitude: W 112° 08' 16"

Primary Drainage Basin and Code: Prickly Pear Creek/10030101

Secondary Drainage Basin: Spring Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active      , Inactive/Exploration      , Abandoned N/A .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Montana Tunnels Mining, Inc., P.O. Box 176, Jefferson City, MT 59638. (406) 933-8314.

Relationship to other mines/sites in the area/district: Now part of MT Tunnels project.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? No permit; site is no longer in existence.

General site features: Elevation 6400' , Slope 5% to NE ,  
Aspect Northeast

Land use: Mining X , Recreational      , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? N/A acres.  
Dimensions:     

Predominant vegetation types: N/A

Access: roads - good      , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites). N/A

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are 16 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Principal rocks are quartz monzonite,  
andesite, aplite, and dacite.

Mining/milling history, ore type/tenor, host rock, gangue: 1865-1956; ore minerals include galena, sphalerite, chalcopyrite,  
tetrahedrite; gangue of altered andesite and a small amount of  
quartz.

Mine Operation?

Shafts - Yes     , No X, #     , Comment No longer exists  
Adits - Yes     , No X, #     , Comment       
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

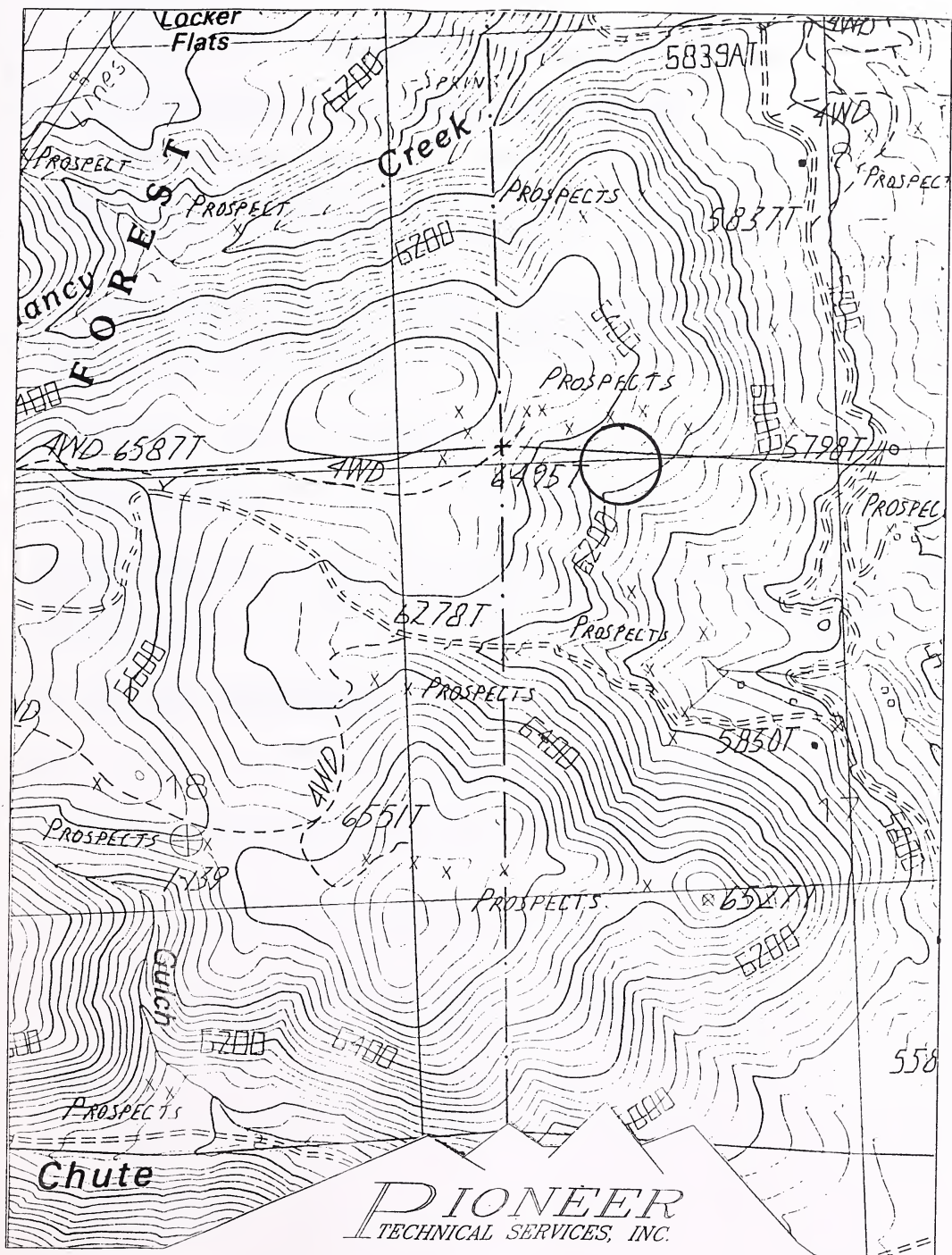
Montana Bureau of Mines and Geology  
Water Well Log Data

11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5430	07N 04W 05 CDCD	32.0	0.0	11.70
M:55788	07N 04W 06 B	105.0	5.0	6.00
M:55789	07N 04W 06 B	165.0	4.0	4.00
M:55790	07N 04W 07 DA	193.0	100.0	6.00
M:5431	07N 04W 08 BDBB	268.2	0.0	18.91
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:5435	07N 04W 16 ACCA	53.1	0.0	39.15
M:5436	07N 04W 16 BBAA	48.7	0.0	26.57
M:5437	07N 04W 16 CDBB	298.7	0.0	66.05
M:5438	07N 04W 16 DBAA	93.1	0.0	73.42
M:5439	07N 04W 16 DBDA	124.0	0.0	113.92
M:5440	07N 04W 16 DCAA	233.0	0.0	15.61
M:55799	07N 04W 21 AAB	65.0	40.0	34.00
M:122591	07N 04W 21 AAC	350.0	3.0	65.00







MINAH, P.A. NO. 22-104

T07N, R04W, SECTIONS 08, 17

SCALE: 1" = 1000'



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



## SAMPLERS:

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs:

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 5 miles?: Yes X, No\_\_\_;  
Number of well logs: 424

Distance to nearest well used for drinking? N/A

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible\_\_\_, Unlikely\_\_\_.

N/A

Other observations/notes: There was a discharging adit that has been french drained to MT Tunnels tailings pond.



### SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No\_\_\_\_, Name(s): N/A

Dry streambeds: Yes\_\_\_\_, No\_\_\_\_, Name(s): N/A

Other surface water: Yes\_\_\_\_, No\_\_\_\_, Name(s)/Description: N/A

Waste materials within any floodplain: Yes\_\_\_\_, No\_\_\_\_ Source ID(s): N/A

Approximate Flood frequency? 1 yr, 10 yr, 100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

Distance between waste source(s) and nearest surface water body (ft)? N/A

Surface water draining onto or through waste sources: Yes\_\_\_\_, No\_\_\_\_, Describe: N/A

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) N/A

Observed erosional / sedimentation / stream turbidity problems? Distance downstream (ft)? Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A

### SAMPLERS:

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

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Wetlands present: Yes     , No     , Describe: N/A

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Carbonate rocks/soils: Yes     , No     , Describe: N/A

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## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100     ;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments N/A

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Nearest residence(ft or miles)? N/A

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For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



## SAMPLERS:

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No\_\_\_\_,  
Describe: N/A

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments N/A

Evidence of recreational use on site: Yes\_\_\_\_, No\_\_\_\_, Describe: N/A

Accessibility - Fences, warning signs, closed roads? N/A

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium <u>X</u> , Low____
Fisheries Habitat and Species Classification -	<u>3</u>
Sport Fishery Classification -	<u>Not Rated</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No\_\_\_\_, Number\_\_\_\_, types and locations:\_\_\_\_  
N/A

Hazardous structures: Yes\_\_\_\_, No\_\_\_\_, Number\_\_\_\_, types and locations:\_\_\_\_  
N/A

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No\_\_\_\_, Number\_\_\_\_,  
types and locations: N/A

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No\_\_\_\_,  
Number\_\_\_\_, types and locations: N/A

Fire and/or Explosion hazards: Yes\_\_\_\_, No\_\_\_\_, Explain: N/A

## **Bibliography**

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Minah, Prepared by Delta Engineering, Date Unknown.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.







22-104, #24: Montana Tunnels project; Minah was located in uppermost cut next to trees



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: WICKES SMELTER PA#: 22-358

Date: August 17, 1993 Time: 2000-2100

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Overcast; cool; cool, wet spring  
and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: SE-2 sample  
location; #6: Stack and slag; #7: SE-1 sample location; #8: WR-1.  
Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): Site accessed by truck. Several occupied residences very close to  
the site.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Residential  
area: Determine TCLP concentrations of smelter wastes. Dispose of  
hazardous materials appropriately; cover and revegetate.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): WICKES SMELTER PA#: 22-358

Legal Description: T 7N ; R 4W ; Sec. 15 , SW 1/4 SW 1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 21' 06" Longitude: W 112° 06' 01"

Primary Drainage Basin and Code: Spring Creek/10030101

Secondary Drainage Basin: Finn Gulch Creek

USGS Quadrangle map name(s): Wickes

Mine Type/Commodities: Smelter/Copper, Zinc, Lead

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Alta Mines Corp., c/o Montana Tunnels Mining, Inc., P.O. Box 176, Jefferson City, MT 59638. (406) 933-8314; Floyd Small, 39 Neill Avenue, Helena, MT 59601. (406) 442-7830; Donald and Ellen Scott, 3934 East Shore Drive, Helena, MT 59601. (406) 475-3015.

Relationship to other mines/sites in the area/district: Located near the Bonanza mine.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 5160' , Slope < 5° ,  
Aspect South

Land use: Mining      , Recreational      , Residential      , Urban      ,  
Agricultural X , Other (Specify)     

Area of disturbed/unvegetated lands? 1 acres.  
Dimensions:     

Predominant vegetation types: Sparse vegetation which includes pine, shrubs, and grasses.

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s)): There are 5 well logs within a 1 mile radius.

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General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by andesite. The smelter lies on both sides (west and east) of the dry Finn Gulch. Water leaving the site would flow north in Finn Gulch to Spring Creek. Spring Creek then flows northeast to confluence with Little Prickly Pear Creek approximately four miles away.

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Mining/milling history, ore type/tenor, host rock, gangue: Smelter was apparently operated in the late 1800's. The mine associated with the smelter was located in 1885, for developing a local source of manganese. Ore averaged approx. 19% manganese. Gangue was andesite with small amounts of calcite, quartz, and some gypsum. Mineralization was vein-like deposits of manganese oxide in andesitic volcanics. The manganese oxides present include pyrolusite, and psilomelane.

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#### Mine Operation?

Shafts - Yes     , No X, #     , Comment                       
Adits - Yes     , No X, #     , Comment                       
Pits - Yes     , No X, #     , Comment                       
Placers - Yes     , No X, #     , Comment                       
Other - Yes     , No X, #     , Comment                     

Mill Operation? Yes X, No     . If yes answer the next three questions:

Period(s) of Operation: No dates cited in literature; apparently operated in the late 1800's.

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Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

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Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? Smelting

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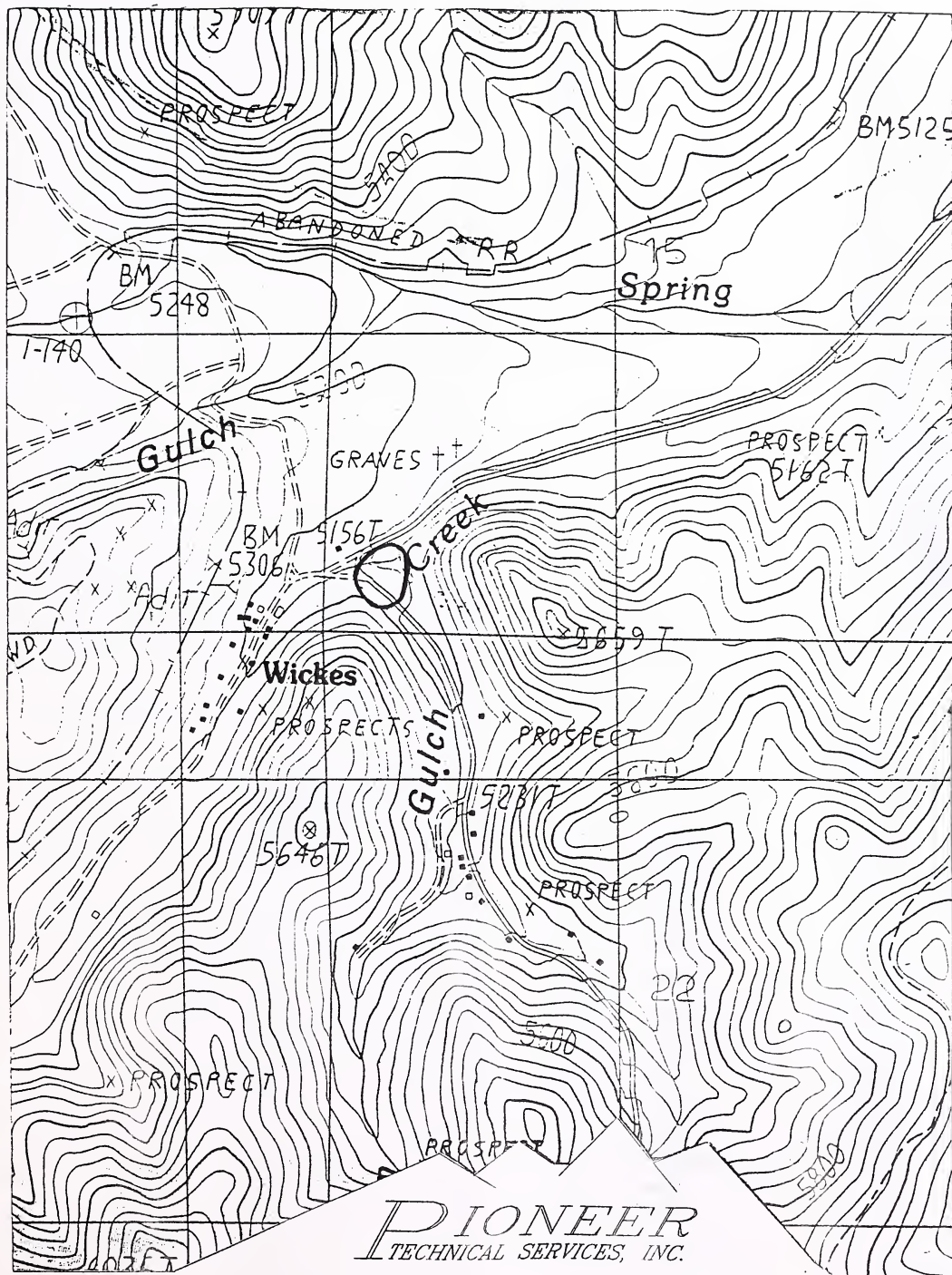
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Montana Bureau of Mines and Geology  
Water Well Log Data

11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55794	07N 04W 11 ACD	23.0	15.0	6.00 (1)
M:55795	07N 04W 11 CA	54.0	40.0	6.00
M:5432	07N 04W 11 CDCD	84.3	0.0	7.34
M:55796	07N 04W 14 B	36.0	40.0	11.00 (2)
M:55797	07N 04W 14 BA	200.0	75.0	31.00
M:55798	07N 04W 14 BA	600.0	500.0	18.00
M:5433	07N 04W 14 BBCC	79.0	0.0	27.53
M:5434	07N 04W 14 BBGD	269.0	0.0	25.46
M:55800	07N 04W 22 C	220.0	15.0	40.00 (3)
M:5435	07N 04W 16 ACCA	53.1	0.0	39.15
M:5436	07N 04W 16 BBAA	48.7	0.0	26.57
M:5437	07N 04W 16 CDBB	298.7	0.0	66.05
M:5438	07N 04W 16 DBAA	93.1	0.0	73.42
M:5439	07N 04W 16 DBDA	124.0	0.0	113.92
M:5440	07N 04W 16 DCAA	233.0	0.0	15.61
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:55799	07N 04W 21 AAB	65.0	40.0	34.00 (4)
M:122591	07N 04W 21 AAC	350.0	3.0	65.00 (5)



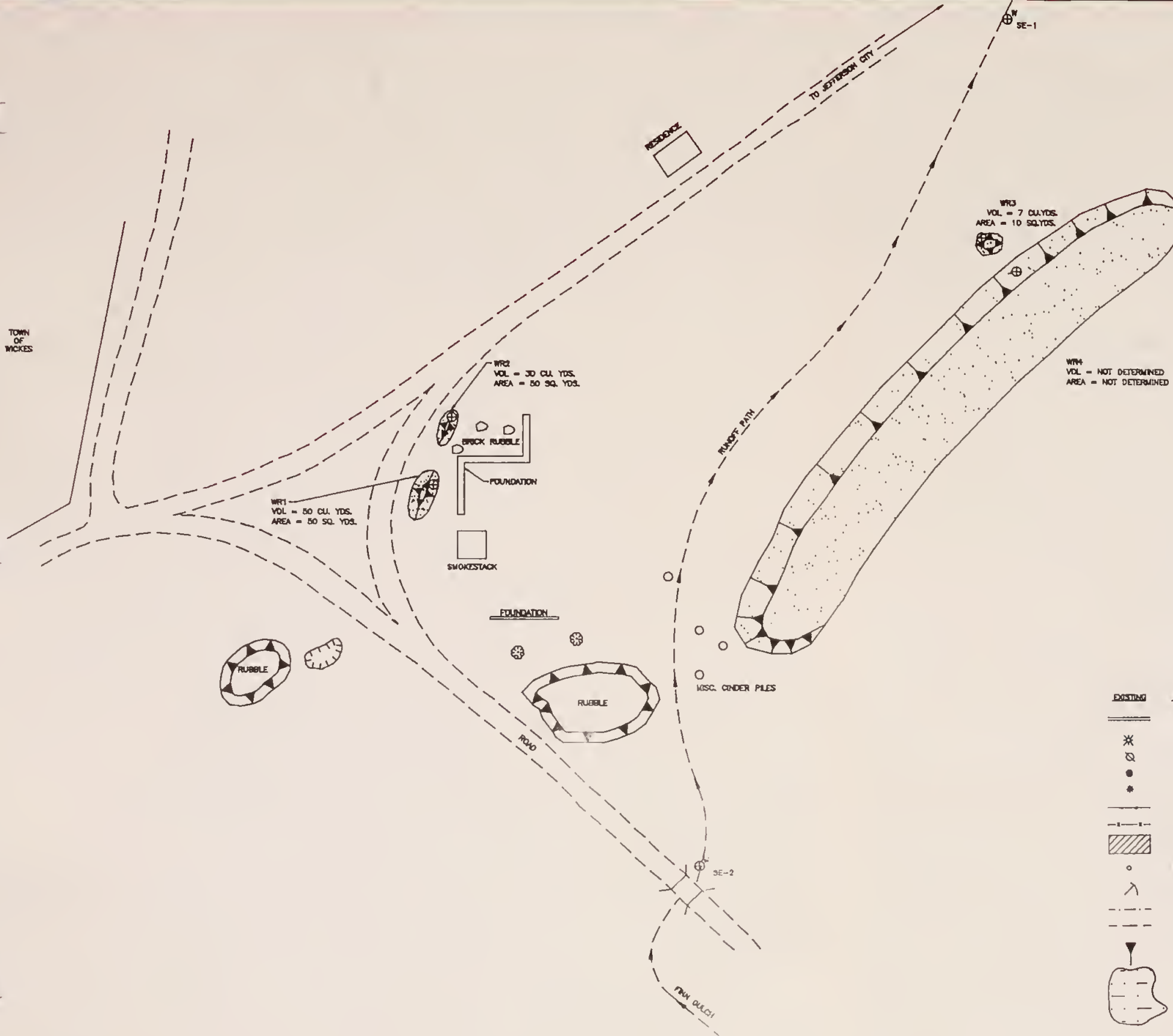


WICKES TAILINGS, P.A. NO. 22-358

T07N, R04W, SECTION 15

SCALE: 1" = 1000'





EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADT
	LIGHT (LIGHT POLE)		COLLAPSED ADT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARRIER POST		SOIL SAMPLE
	GATE		XRF SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE
	SLOPE DIRECTION		DRAINAGE
	TAILINGS POND		WATER WELL
			PONDED WATER
			VEGETATED WET LANDS

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

WICKES SMELTER PA# 22-358  
COLORADO DISTRICT JEFFERSON COUNTY

DRAWN: CAN DATE: 12/15/81  
DESIGNED: TPR JOB NO.: 93-17  
APPROVED: F.B. NO.:

**PIONEER**  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
SPokane

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
SPokane

**TDSH**

SHEET NO.





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock, Pierson

D-Direct reading (Kalvey Meter); S-Saturated Paste (Orion Meter)

MDSL AMRB/PIONEER 4/9/93

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 97

Distance to nearest well used for drinking? Residence across road,  
upgradient approximately 100 feet from the stack.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh  
(meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely\_\_\_.

Due to percolation of precipitation through the waste material.

Other observations/notes: N/A

**SAMPLERS:** Belanger

[illegible]

**NOTE:** Estimated (E) or Measured (M) from edit, audit, wrap, or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes ☐, No ☒, Name(s): \_\_\_\_\_

Dry streambeds: Yes ☒, No ☐, Name(s): Runoff path in Finn Gulch

Other surface water: Yes ☐, No ☒, Name(s)/Description: \_\_\_\_\_

Waste materials within any floodplain: Yes ☒, No ☐ Source ID(s): Slag piles

Approximate Flood frequency? ☐ 1 yr, ☒ 10 yr, ☐ 100 yr

Estimated seasonal flow of stream(s) (cfs)? \_\_\_\_\_

High Flow: 15 gpm, Average Flow: 0-3 gpm

Distance between waste source(s) and nearest surface water body (ft)? 100 feet

Surface water draining onto or through waste sources: Yes ☐, No ☒, Describe: \_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Stock watering, fishery, irrigation, possible recreation and residential in Little Prickly Pear Creek.

Observed erosional/sedimentation/stream turbidity problems? Yes ☐, No ☒, Distance downstream (ft)? \_\_\_\_\_ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_

**SAMPLERS:** Belanger

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

##### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

##### General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes     , No X, Describe:                     

#### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100     ;  
100-300     ; 300-1,000 X; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments                     

Nearest residence(ft or miles)? 40 feet

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none

**SAMPLERS:** Bullock, Belanger, Pierson

[illegible]

Notes and Clarifications: ND = Not Determined

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No     ,  
Describe: Residential houses

Population within 1 mile: 1-10     ; 10-30     ; 30-100 X; 100-300     ;  
300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ;  
Comments     

Evidence of recreational use on site: Yes     , No X, Describe:       
Although very likely due to close proximity to Wickes.

Accessibility - Fences, warning signs, closed roads? Site is partially  
fenced.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
Wilderness Area -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
T&E Species Habitat -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>
Bat Habitat -	Yes <u>    </u> , No <u>X</u> , Comment <u>    </u>

Primary Drainage     ; Secondary Drainage X; No Information     :

Riparian Habitat Quality - High     , Medium X, Low       
Wetlands Frontage - High     , Medium X, Low       
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - Not Rated

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes     , No X, Number     , types and locations:     

Hazardous structures: Yes X, No     , Number 1, types and locations: Stack

Unstable highwalls, pits, trenches, slopes: Yes     , No X, Number     ,  
types and locations:     

Unstable waste piles, impoundments, undercut banks: Yes     , No X,  
Number     , types and locations:     

Fire and/or Explosion hazards: Yes     , No X, Explain:

## Bibliography

- Fernette, Greg and Jones, William, BLM GEM Resource Evaluation of Elkhorn GRA, Montana, Including the Elkhorn Wilderness Study Area and the Black Sage WSA, October 1983.
- MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 53-54.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Wickes Tailings, Prepared by Delta Engineering, Date Unknown.
- Mitchell, William, Field Work on the Blackbird Mine, Jefferson County, Manganese, Summer of 1941.
- Sharp, Ernest H., Assistant Mining Engineer, Report for the Metallurgical Division on the Metcalf - McClellan - Eackley Lease of the Pearson Property, Wickes, Montana, April 4, 1941.
- Sharp, Ernest H., Assistant Mining Engineer, Report For the Mining Division (Supplement to the Metallurgical Report) on the Metcalf - McClellan - Eackley Lease of the Pearson Property, Wickes, Montana, April 12, 1941.
- Tolman, Carl, The Black Bird Group of the Wickes-Corbin Manganese Property, Jefferson County, Montana, Written for the USGS, Date Unknown.
- USGS, Topographic Map, Wickes, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

WICKES SMELTER  
PA NO. 22-358





Wickes Tailings PA# 22-358  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-358-SE-1	77 J	38.9 J	1.5 J	3.7 J	4 J	188 JX	11200 J	4.8	354 J	4 J	700 J	5 U	384 JX	NR
22-358-SE-2	33 J	66.4 J	0.5 U	6.9 J	5 J	237 JX	16800 J	0.035 U	574 J	8 J	344 J	6 U	256 JX	NR
22-358-WR-1	613 J	67.9 J	15.7 J	18.9 J	5.7 J	6450 JX	65400 J	3.18	2940 J	8 J	25600 J	20	19000 JX	NR
22-358-WR-2	789 J	109 J	8.7 J	10.4 J	9.6 J	2370 JX	31900 J	20.9	1020 J	6 J	9400 J	26	6040 JX	NR
22-358-WR-3	4290 J	25.9 J	26.6 J	4.4 J	5.9 J	3780 JX	33500 J	35.2	467 J	3 J	31700 J	22	2960 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENT. t/1000	NEUTRAL. POTENT. t/1000	SULFUR ACID/BASE POTENT. t/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID/BASE POTENT. t/1000	PYRITIC SULFUR ACID/BASE POTENT. t/1000
22-358-WR-1	1.82	56.9	-6.4	-63	0.47	0.46	14.4	-20.8
22-358-WR-2	0.77	24.1	5.91	-18	0.44	0.07	2.19	3.72
22-358-WR-3	2.38	74.4	2.48	-71	1.8	0.15	4.69	-2.21

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-358-GW-1	0.96 U	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	37.8	0.18 J	18.2	12.7 U	1.13	30.7 U	15.9	0.2

U - Not Detected J - Estimated Quantity X - Outlier for Accuracy or Precision NR - Not Requested

LEGEND

GW1 - QA/QC Blank.

SE1 - Downgradient of site.

SE2 - Upgradient of site.

WR1 - Sample from the WR4 subsample.

WR2 - Sample from the WR1 subsample.

WR3 - Sample from the WR2 subsample.

BACKGROUND - From the Bertha Mine (22-002-SS-1).



XRF ANALYSIS RESULTS

WICKES SMELTER  
PA NO. 22-358



Mine Name: Wickes Tailings PA# 22-358  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrH	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-358-WR-1		9960.73	19388.5	889.028		744.828 *	57200.5	406.739 *	5968.47	3570.13	4279.86	279.176
22-358-WR-2		18992.3	9813.14	1666.72		1406.53	29392.4		1337.69	1100.3	540.518	516.804
22-358-WR-2-COMP		18623.7	10871.1	1926.81		1752.87	43952.1		3172.3	6128.27	478.134 *	359.401
22-358-WR-2-DUP		16607.5	9001.7	1296.16		1112.92	24331.3		1150.42	1008.53		456.458
22-358-WR-3		19470.2	8495.1	1972.83		1714.13	53328.5	515.743 *	4316.18	9168.8	477.044 *	254.18
22-358-WR-4		10056.8	8979.16	1892.71		4735.19	51434.3		11900.9	16325.8		179.33
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
22-358-WR-1	119.646	74.3877 *	8.85913 *	27277.8	129.065	225.372 *	364.772	674.355	232.904 *		47.2977 *	
22-358-WR-2	183.079			4826.43	137.573		77.5128 *	762.285			29.0369 *	
22-358-WR-2-COMP	180.044	49.3296 *	9.60753 *	7858.52	163.552		133.755 *	637.009			25.698 *	
22-358-WR-2-DUP	167.499			3483.71	123.743		106.313	676.484	118.664 *			
22-358-WR-3	161.163	64.6774 *	13.0357 *	10685.9	198.38	175.888 *	167.419 *	456.508	137.652 *		26.7091 *	
22-358-WR-4	123.184			19441.8	97.9133	285.818 *	99.1229 *	175.076	194.665 *			

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

WICKES SMELTER  
PA NO. 22-358



# **AIMSS SCORESHEET**

SITE NAME:

WICKES SMELTER

PA NUMBER:

22-358

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	12.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	92
8		NEAREST WELL	10
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9

		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	0
19	SW - TARGETS	FISHERY	5
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23

		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	300
30		NEAREST RESIDENCE	10
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34

		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	200
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	30
41	TARGETS	NEAREST RESIDENCE	10
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE  
(LINES 10 + 24 + 35 + 44) / 100,000

0.44

SITE NAME:

WICKES SMELTER

PA NUMBER:

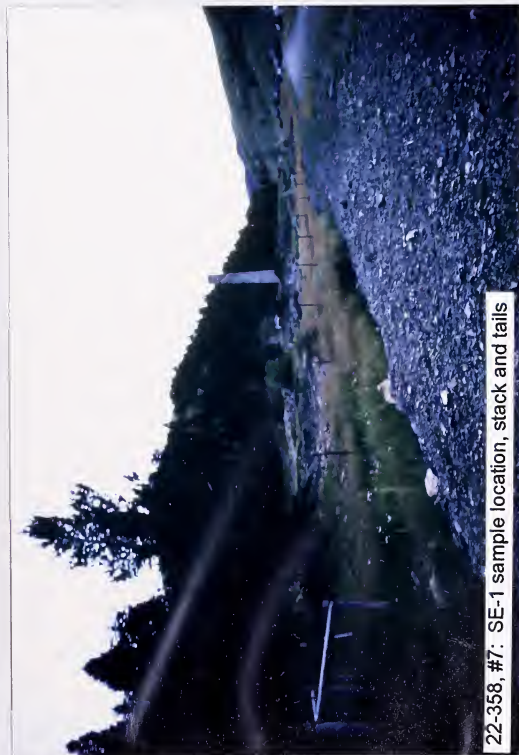
22-358

LINE  
NO.**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	40
9		POPULATION - 1 MILE		30
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	40
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>32.00</b>



22-358, #5: SE-2 sample location



22-358, #7: SE-1 sample location, stack and tails



22-358, #8: WR-1



22-358, #6: Stack and overall view of the site









MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ELKHORN QUEEN PA#: 22-027

Date: August 16, 1993 Time: 1630

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; slight drizzle; cool  
(55°F); slight breeze (5-7 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #12: Adit and  
headframe with shaft; #13: Loadout; #14: WR-1.  
Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Place dump  
material in shaft or fill in stope. Reprocess for lead.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ELKHORN QUEEN PA#: 22-027

Legal Description: T 6N ; R 3W ; Sec. 26 , SE1/4 NW1/4 1/4

County: JEFFERSON Mining District: ELKHORN

Latitude: N 46° 14' 46" Longitude: W 111° 56' 42"

Primary Drainage Basin and Code: Elkhorn Creek/10020006

Secondary Drainage Basin: South Fork Queen Gulch

USGS Quadrangle map name(s): Tacoma Park

Mine Type/Commodities: Hardrock/Gold, Silver, Lead, Zinc, Copper

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Louisa Rothfus,  
2100 Oregon Avenue, Butte, MT 59701. (406) 723-8852; Deerlodge  
National Forest.

Relationship to other mines/sites in the area/district: The  
Tacoma mine is approx. two miles to the southwest.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6400' , Slope 6° ,  
Aspect North

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? < 0.5 acres.  
Dimensions:     

Predominant vegetation types: Pine; grasses

Access: roads - good      , poor      , 4wd X , trail      .  
Other logistical considerations (proximity to other sites). Gate  
is locked from South Fork of Queen Gulch.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MEMG Well Log Printout(s): There are 4 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Nearest surface water is the South Fork of Queen Gulch, 1000' to the north. Site lies near the contact of limestone with a quartz porphyry.

Mining/milling history, ore type/tenor, host rock, gangue: Total of 11,820 tons of ore mined from Queen between 1905 to 1956. From this, 1,852 oz. Au, 149,794 oz. Ag, 13,138 lbs. of Cu, 1,940,063 lbs. Pb, and 356,163 lbs. of Zn was recovered. Deposit was discovered in 1880 and had been mined to a 300' level by 1900. The mine was idle until 1942, when it was reopened. Mine was at the contact of limestone and quartz porphyry. Ore consisted of vitreous quartz containing galena and a small amount of sphalerite. Ore shipped in 1948 averaged 0.33 oz/ton Au, 9.2 oz/ton Ag, 5% Pb, and 1.5% Zn.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment Headframe; open

Adits - Yes X, No     , # 1, Comment Timbered; open

Pits - Yes     , No X, #     , Comment     

Placers - Yes     , No X, #     , Comment     

Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

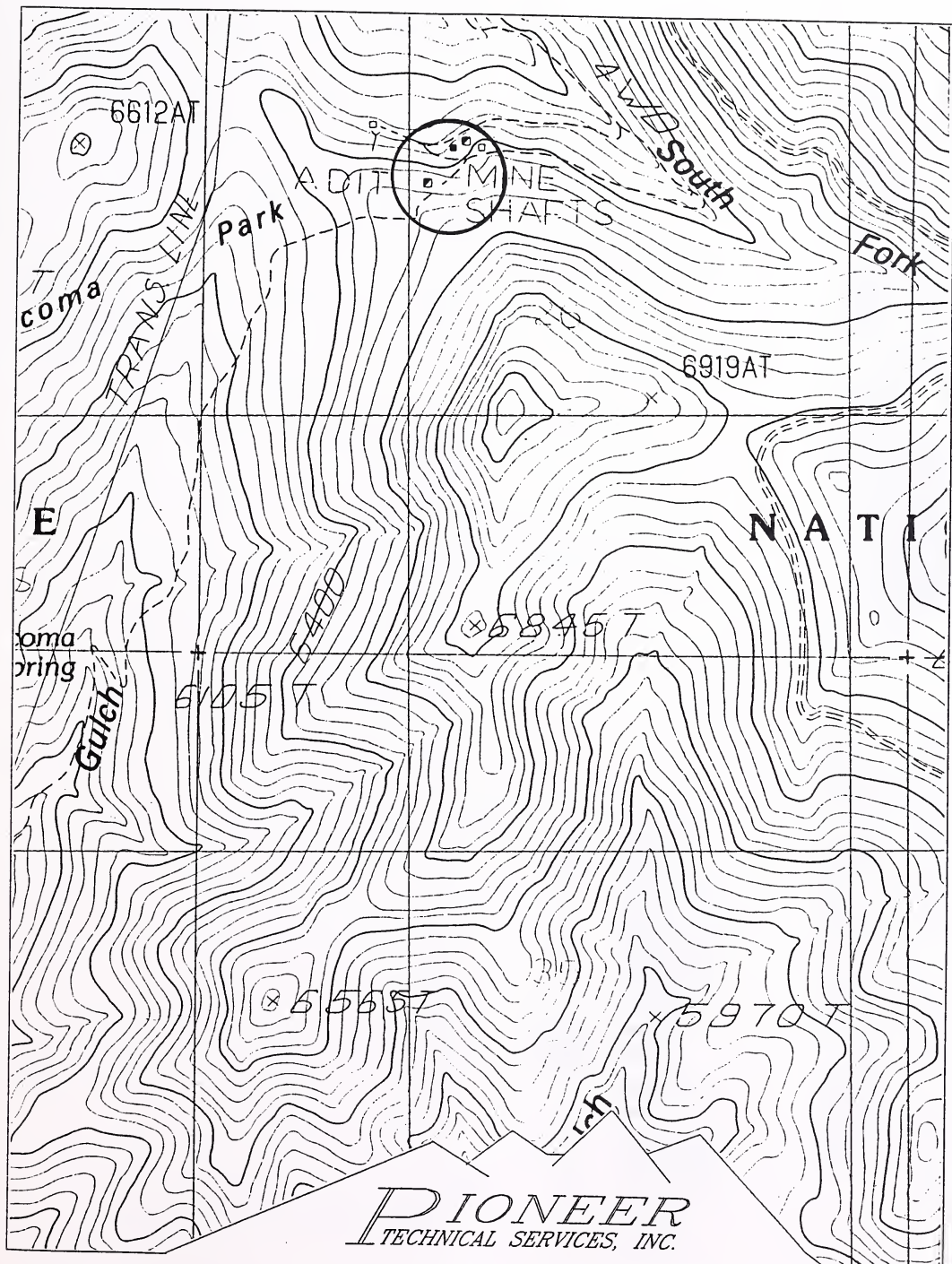
Montana Bureau of Mines and Geology  
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5402	06N 03W 22 ABB	65.0	0.0	6.37
M:5400	06N 03W 22 ABB	18.0	0.0	6.97







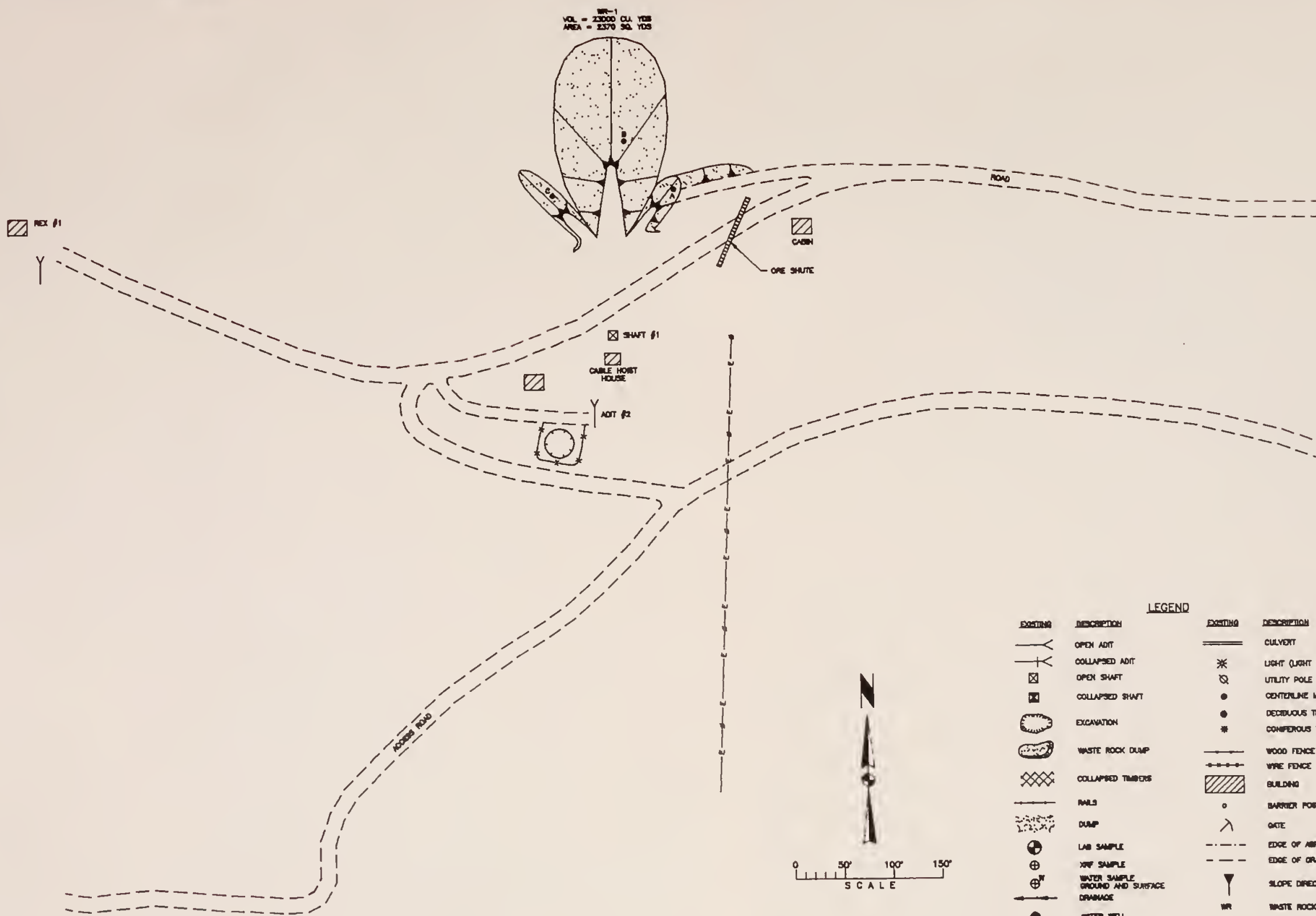
**PIONEER**  
TECHNICAL SERVICES, INC.

ELKHORN QUEEN, P.A. NO. 22-027

T06N, R03W, SECTION 26

SCALE: 1" = 1000'





MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

ELKHORN QUEEN PA# 22-027  
ELKHORN DISTRICT JEFFERSON COUNTY

DRAWN: MWC DATE: 10/83  
DESIGNED: TPR JOB NO.: 93-17  
APPROVED: F.B. NO.

**PIONEER**  
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
WASHINGTON

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Babits

[illegible]

P-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 22-027-WR-1 is composite of WR-1A through -1C. See Tacoma (22-284) for background soil sample.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 12

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely\_\_\_.

Uncontained source; metal values for Zn, Fe, As, Pb, and Cd were fairly high, but no shallow water table in the area.

Other observations/notes: N/A

## SAMPLERS:

[illegible]

**FLOW:** Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s): \_\_\_\_\_

Dry streambeds: Yes\_\_\_\_, No X, Name(s): \_\_\_\_\_

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description: \_\_\_\_\_

Waste materials within any floodplain: Yes\_\_\_\_, No X Source ID(s): \_\_\_\_\_

Approximate Flood frequency? \_\_\_\_1 yr, \_\_\_\_10 yr, \_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: \_\_\_\_\_, Average Flow: \_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)?  
1,000 feet between WR-1 and South Fork Queen Gulch.

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, wetland, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_,  
No X, Distance downstream (ft)? \_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):  
N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)  
Presence of evaporative salt deposits? (ESD)  
Discolored or turbid seepage? (SPG)  
Presence of long filamentous algae in drainages, mosses in moist areas?  
Presence of ferric hydroxide precipitates? (FEOX)  
Presence of burned or stressed vegetation? (VEG)  
pH ≤ 5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes X, No     , Describe: Limestone was observed.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments                     

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:  
observed high moderate low none

## SAMPLERS: Babits

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X;  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Fire  
pit

Accessibility - Fences, warning signs, closed roads? Unrestricted  
from Tacoma Gulch; warning signs are present.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Bat Habitat - Yes X, No\_\_\_\_, Comment Adit

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
One adit and one shaft

Hazardous structures: Yes X, No\_\_\_\_, Number 2, types and locations:\_\_\_\_  
Headframe and loadout

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1,  
types and locations: Slope

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Four buildings



## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 54-61.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Elkhorn Queen, Prepared by Northern Engineering and Testing, September 12, 1988.

USGS, Topographic Map, Tacoma Park, Montana, 7 1/2 minute Quadrangle, 1986.



LABORATORY ANALYTICAL DATA

ELKHORN QUEEN  
PA NO. 22-027



Elkhorn Queen PA# 22-027  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-027-WR-1	10100 J	118 J	405 J	28.4	2.38	87.6	112000	0.441	2590	19.1	40200 J	64.6 J	20000 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.038	1170	6.23	38.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL		SULFUR		NEUTRAL		SULFUR		PYRITIC		ORGANIC		PYRITIC		SULFUR	
	SULFUR %	ACID BASE 1/1000	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	SULFUR %	ACID BASE POTENT. 1/1000	ACID BASE POTENT. 1/1000
22-027-WR-1	4.24	132	38.0	-94.4	<0.01	3.08	2.06	96.2	-58.2							

LEGEND

WR1 - Composite of all samples WR1A, 1B, and 1C.  
BACKGROUND - From Tacoma (22-284-SS-1).



**XRF ANALYSIS RESULTS**

**ELKHORN QUEEN  
PA NO. 22-027**





Mine Name: Elkhorn Queen PA # 22-027  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-027-SS-1		17368.9	11093.2	2149.72		1539.81	21382.4			97.0928 *	77.739 *	365.96
22-027-WR1-A	760.678 *	36575.5	18014.7	2382.89		1062.47 *	49084.9		72.9983 *	14059.5	7437.74	175.024
22-027-WR1-B		6173.06	14960.7	189.168 *		9859.43	281475			18291.4	33754.3	225.662
22-027-WR1-C	504.004 *	55944.5	6773.99	1283.52		644.515 *	27254.3		72.3079 *	3773.65	586.979	139.225
22-027-WR-1-COMP	504.004 *	55944.5	6773.99	1283.52		644.515 *	27254.3		72.3079 *	3773.65	586.979	139.225
22-027-SS-1	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
22-027-WR1-A	224.998			6759.78	103.442			629.218	67.7631 *		12.3213 *	
22-027-WR1-B	120.321			3374.54	127.391	346.537 *	83.7097 *	217.922	246.072 *		29.9028 *	
22-027-WR1-C	58.195			2313.47		1179.97		381.342	260.639 *			
22-027-WR-1-COMP	144.754			2313.47	231.98	152.719 *		668.242	166.338 *		13.8853 *	
	144.754			2313.47	231.98	152.719 *		668.242	166.338 *		13.8853 *	

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

ELKHORN QUEEN  
PA NO. 22-027



# AIMSS SCORESHEET

SITE NAME:

ELKHORN QUEEN

PA NUMBER:

22-027

LINE NO.			
<b>GROUNDWATER PATHWAY</b>			
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 507.278
6		WELLS - 1 MI. x 2.5	10.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	8
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 18.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 365240
<b>SURFACE WATER PATHWAY</b>			
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 549.077
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	10
19		FISHERY	0
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22 17
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 373372
<b>AIR PATHWAY</b>			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 5.491
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33 40
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 10982
<b>DIRECT CONTACT PATHWAY</b>			
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 5.073
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	2
43		TARGETS SCORE	SUM LINES 40 - 42 2
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 1522
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		
			7.51

LINE  
NO.

SITE NAME:  
PA NUMBER:

ELKHORN QUEEN  
22-027

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	305
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>12.20</b>





22-027, #13: Loadout



22-027, #12: Adit and headframe for shaft (foreground)



22-027, #14: WR-1



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: QUEEN/TOURMALINE QUEEN PA#: 22-111

Date: August 16, 1993 Time: 1200

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; occasional rain;  
cool (50°-55°F); slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #9, #10: WR-1,  
panorama; #11: WR-1, stream, and road. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Site is labeled as "Queen" on BLM map.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Steep bedrock  
will be impossible to revegetate, must leave as is.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): QUEEN/TOURMALINE QUEEN PA#: 22-111

Legal Description: T 6N ; R 3W ; Sec. 22 , SW1/4 NE1/4 1/4

County: JEFFERSON Mining District: ELKHORN

Latitude: N 46° 15' 00" Longitude: W 111° 57' 00"

Primary Drainage Basin and Code: Boulder River/10020006

Secondary Drainage Basin: Elkhorn Creek

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active      , Inactive/Exploration X , Abandoned      .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Mountain West Res., 674 Sudden Valley, Bellingham, WA 98226; Susan Parker and Mary Lewis, 74394 Wortman Rd., Rainier, OR 97048. (503) 556-9039; A.P. and Robert Henningsen, 4320 Fern Valley Rd., Medford, OR 97501. (503) 535-4535; Merridy Hocking, 3579 E. 100th N., Rigby, ID 83442. (208) 754-8713; Hanson Natural Resources Co., Gold Fields Mining Co., 1687 Cole Blvd., Golden, CO 80402. (303) 231-9700; Edward Murphy, Jr., 356 NW 52nd, Seattle, WA 98107; David and Mary Walker, 1114 Maryland, Butte, MT 59701. (406) 782-3832; Martha Youlden, P.O. Box 1753, Grand Forks, ND 58201; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Other  
mines upgradient on Elkhorn Creek.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6000' , Slope 20° ,  
Aspect Southeast

Land use: Mining X , Recreational      , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 2.5 acres.  
Dimensions: 640 feet x 150 feet

Predominant vegetation types: Raspberry, mullen, pine, thistle.

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 10 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Perennial Elkhorn Creek flows north to south 20 feet east of the site. Deposit occurs at contact of andesite and Precambrian sediments.

Mining/milling history, ore type/tenor, host rock, gangue: Deposit was explored by 12 adits ranging in length from 25 to 100 feet; recently it has been turned into an open pit. Gold ore occurs along contact with Precambrian sediments and andesite. Ore contains iron pyrite, pyrrhotite, and arsenopyrite in a gangue of tourmaline, epidote, actinolite. As of 1960, no recorded ore has been produced.

#### Mine Operation?

Shafts - Yes ☐, No ☒, # , Comment   
Adits - Yes ☐, No ☒, # , Comment   
Pits - Yes ☒, No ☐, # 1, Comment Large two acre pit  
Placers - Yes ☐, No ☒, # , Comment   
Other - Yes ☐, No ☒, # , Comment

Mill Operation? Yes ☐, No ☒. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ☐ Dedicated Mill ☐; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

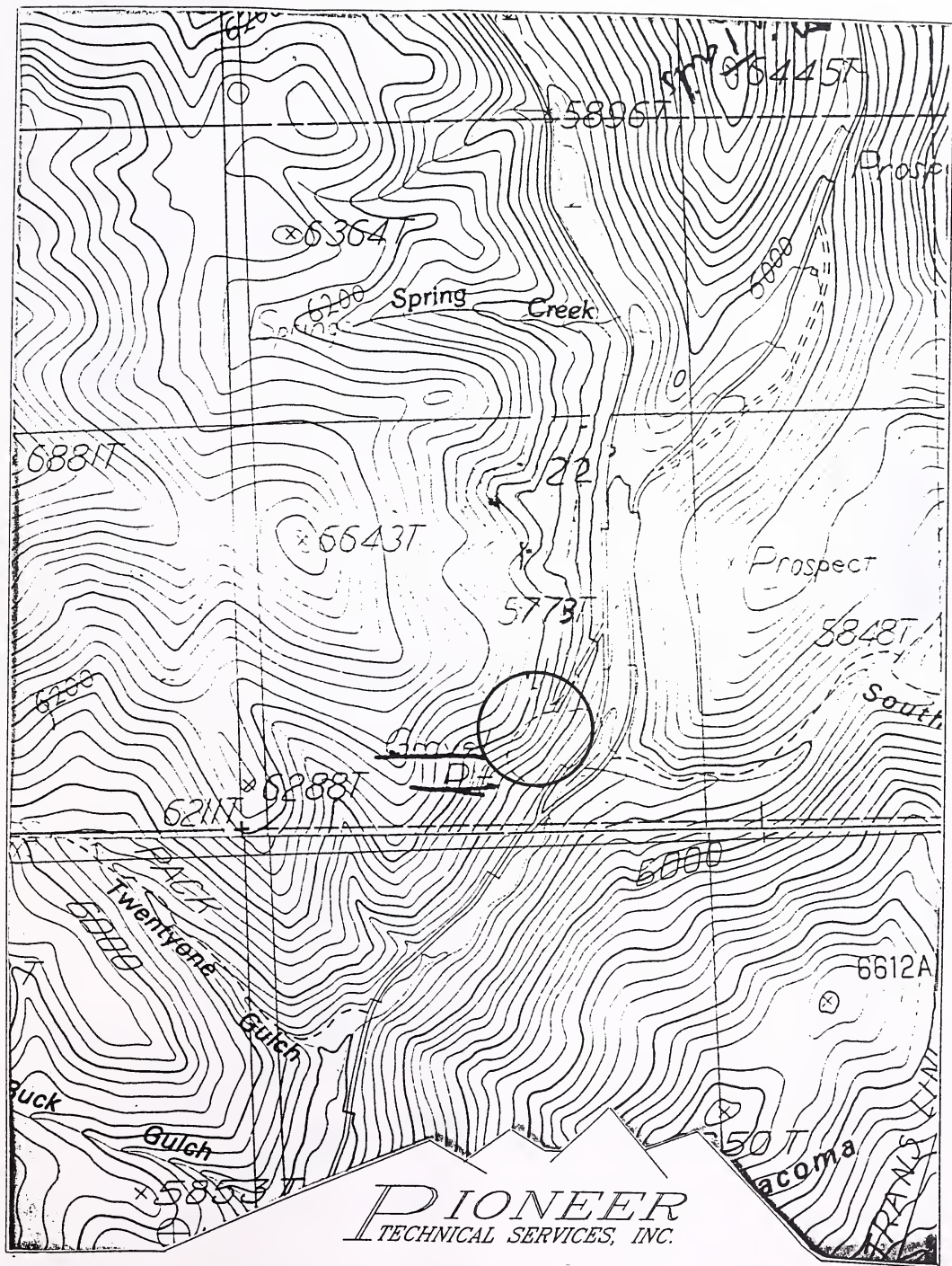
Montana Bureau of Mines and Geology  
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53337	06N 03W 14	110.0	20.0	20.00
M:53338	06N 03W 14 BA	185.0	99.0	170.00
M:53341	06N 03W 15	84.0	3.0	15.00
M:53340	06N 03W 15	64.0	30.0	10.00
M:53339	06N 03W 15	125.0	20.0	5.00
M:53342	06N 03W 15 DAC	27.0	1.0	15.00
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5402	06N 03W 22 ABB	65.0	0.0	6.37
M:5400	06N 03W 22 ABB	18.0	0.0	6.97







**PIONEER**  
TECHNICAL SERVICES, INC.

QUEEN, P.A. NO. 22-111

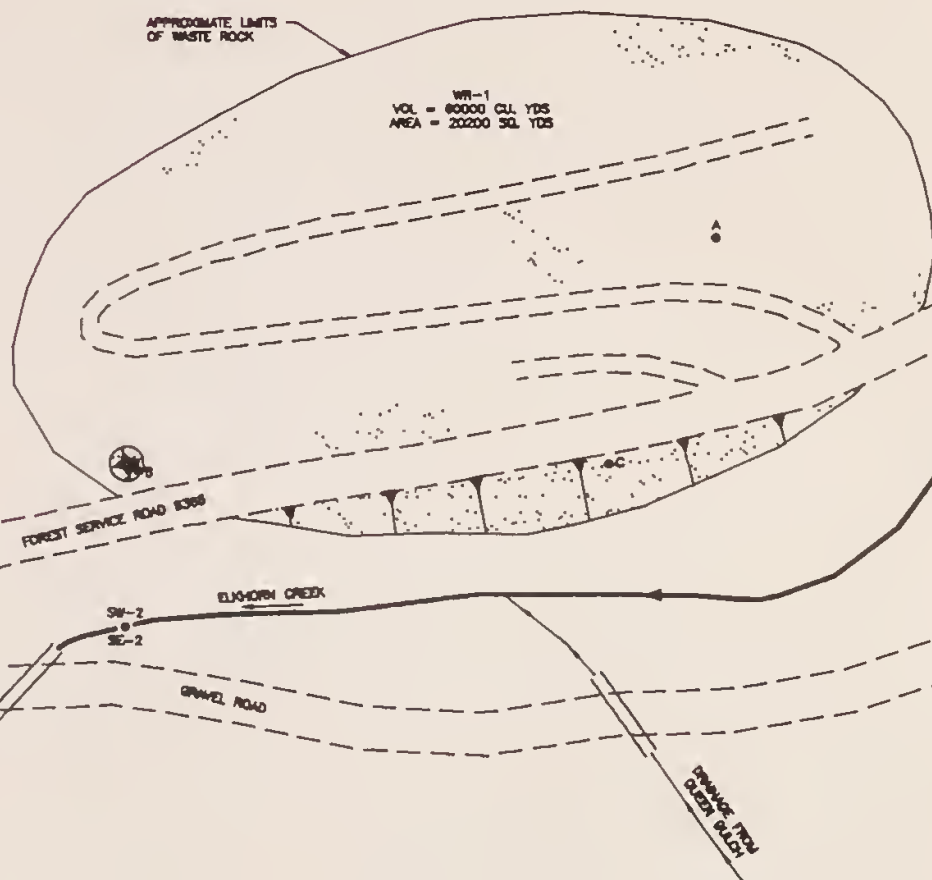
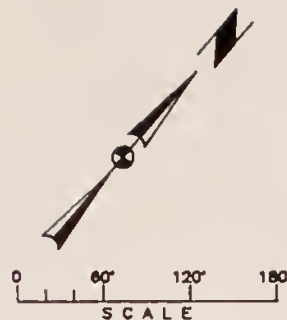
T06N, R03W, SECTION 22

SCALE: 1" = 1000'



# LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	LAB SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE		EDGE OF ASPHALT
	GROUND AND SURFACE DRAINAGE		EDGE OF GRAVEL
	WATER WELL		SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

QUEEN PA# 22-111  
ELKHORN DISTRICT JEFFERSON COUNTY

SHEET NO.

**PIONEER**  
ENGINEERING CONSULTANTS

**TDSH**

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN LMC DATE 9/83  
DESIGNED TPR JOB NO. 93-17  
APPROVED F.B. NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





**SAMPLERS:** Babits

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 22-111-WR-1 is composite of WR-1A through -1C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;  
Number of well logs: 12

Distance to nearest well used for drinking? Approx. 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely\_\_\_.

Uncontained source with elevated metal values close to a perennial stream.

Other observations/notes: N/A

### SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Elkhorn Creek

Dry streambeds: Yes    , No X, Name(s):                     

Other surface water: Yes    , No X, Name(s)/Description:                     

Waste materials within any floodplain: Yes X, No     Source ID(s):      
Tailings from upgradient site are in Elkhorn Creek.

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? 6.4 during investigation  
High Flow: 80 cfs, Average Flow: 8 cfs

Distance between waste source(s) and nearest surface water body (ft)?      
Approx. 20 feet between WR-1 and Elkhorn Creek.

Surface water draining onto or through waste sources: Yes    , No X,  
Describe:                     

Surface water use within 15 miles downstream? (Drinking water supply, irrigation,  
residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Fishery, irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes    ,  
No X, Distance downstream (ft)?                      Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present):                       
None observed during this investigation.



**SAMPLERS:** Lasher

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

 Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured |

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X, No     , Describe: Streamside

Carbonate rocks/soils: Yes X, No     , Describe: Limestone was observed.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X ;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments     

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
            observed          high          moderate          low          none

## SAMPLERS: Babits

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Off-  
road vehicle tracks

Accessibility - Fences, warning signs, closed roads? Closed; barb-  
wire fence

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 5  
Sport Fishery Classification - 5

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 54-65.

MBMG, Sampling and Analysis Plan and Analytical Data for Queen, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

QUEEN/TOURMALINE QUEEN  
PA NO. 22-111



Queen PA# 22-111  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
22-111-SE-1	156 J	37 J	45.1 J	4.17	9.32	279	14700	23.4	1570	5.36	2010 J	110 J	6880 J	NR
22-111-SE-2	140 J	17.8 J	36.3 J	2.47 U	6.29	212	14400	14.6	1050	4.81	1800 J	103 J	6140 J	NR
22-111-WR-1	1420 J	37.4 J	1.2 J	14.3	12.5	33.4	87600	0.032 U	395	5.93	73.4 J	4.73 U	167 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.038	1170	6.23	382.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. U/1000	SULFUR ACID BASE POTENT. U/1000
22-111-WR-1	0.47	14.7	1.90	-12.8	0.09	<0.01	0.00	1.90

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO <sub>3</sub> /L)	HARDNESS CALC.
22-111-SW-1	3.42	10.6	2.57 U	9.7 U	6.83 U	5.77 J	300	0.44 J	21.5	12.7 U	22.8	30.7 U	65.2	62.7
22-111-SW-2	4.39	11.1	2.57 U	9.7 U	6.83 U	4.03 J	262	0.36 J	18.9	12.7 U	21.7	30.7 U	58.4	61.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-111-SW-1	108 <	5.0	10 <	0.05	NR
22-111-SW-2	114 <	5.0	10	0.08	NR

LEGEND

SE1 - Upstream on Elkhorn Creek.  
SE2 - Downstream on Elkhorn Creek.  
WR1 - Composite of subsamples WR1A, 1B, and 1C.  
BACKGROUND - From Tacoma (22-284-SS-1).

SW1 - Same as SE1.  
SW2 - Same as SE2.





XRF ANALYSIS RESULTS

QUEEN/TOURMALINE QUEEN  
PA NO. 22-111



Mine Name: Queen PA# 22-111  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-111-WR1-A	488.876 *	26335.6	12629	1603.72		832.246 *	40730.4		77.7693 *	10565.4	5381.41	137.763
22-111-WR1-B	383.03 *	15486.3	11040.3	2001.5		832.14 *	85931.2		74.6984 *	115.001 *	1841.44	340.873
22-111-WR1-C	406.206 *	15398.3	15472.7	2384.65		891.164 *	45795.1		75.1012 *	113.15 *	366.869	409.227
22-111-WR-1-COMP		12673.3	12944.5	1914.62		531.004 *	102861		60.6545 *	196.491	1655.42	386.332
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
22-111-WR1-A	91.6344			5121.84	94.7591	237.365 *		157.222	199.68 *		20.2538 *	
22-111-WR1-B	193.11				87.2706			634.163	110.962 *		12.6124 *	
22-111-WR1-C	217.386			25.5882 *	86.4647			740.192	103.398 *		12.7551 *	
22-111-WR-1-COMP	173.266	46.1419 *		50.8364 *	83.8241	165.705 *		831.347			8.28774 *	

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

QUEEN/TOURMALINE QUEEN  
PA NO. 22-111



# **AIMSS SCORESHEET**

SITE NAME:QUEEN/TOURMALINE QUEEN  
PA NUMBER: 22-111

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	42.969
6		WELLS - 1 MI. x 2.5		25.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		2
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	27.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>464065</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	45.158
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	17
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>307074</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.505
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>3010</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.432
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>286</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			<b>7.74</b>
	(LINES 10 + 24 + 35 + 44) / 100,000			



LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	10
2		OPEN SHAFTS 100 EA.	0
3		OPEN ADITS 50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS 75 EA.	0
5		HAZ. STRUCTURES 40 EA.	0
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8		HAZARDS SCORE SUM LINES 2 - 7	0
9		POPULATION - 1 MILE	0
10	TARGETS	NEAREST RESIDENCE	0
11		RECREATIONAL USE	2
12		TARGETS SCORE SUM LINES 9 - 11	2
13		SITE SAFETY SCORE (LINES 1 x 8 x 12) / 1,000	0.00

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

LAB ID SAMPLE ID

Cr CrC Crq Ni Nlc Nlq Cu Cuc Cuq Zn Znc Zng As Asc Asq Ag Agc Agq

DISSOLVED METALS: (ppb)

92Q881	FNPS10M	0.00	U	0.00	U	3.78	B	20.04	B	4.91	B	0.00	U
92Q882	FNPS20M	0.00	U	0.00	U	0.00	U	36.52	B	1.76	B	0.00	U
92Q883	FNPS30M	0.00	U	0.00	U	3.29	B	42.82	B	5.30	B	0.00	U
92Q887	FNPS40L	-1.34	U	0.14	U	2.22	U	20.68	U	0.89	U	-1.12	U
92Q888	FNPS50L	-1.42	U	0.06	U	1.91	U	55.58	U	0.67	U	-1.11	U
92Q880	FNPS60L	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U	0.00	U

TOTAL RECOVERABLE METALS: (ppb)

92Q974	FNPS40L	0.00	U	0.00	U	2.82	B	31.96	B	0.00	B	0.00	U
92Q975	FNPS50L	0.00	U	0.00	U	0.00	U	16.54	B	2.70	B	0.00	U

TOTAL METALS: (ppm)

92S889	FNPD10H	3.62	B	0.52	U	319.91	N	16561.08	N	445.26	U	70.23	U
92S890	FNPD20H	0.00	U	0.00	U	1.72	U	1.94	U	0.00	U	0.00	U

B AND H MINE

DISSOLVED METALS: (ppb)

92Q1471	JBHS10M	-1.50	U	0.53	U	1.44	U	5.15	U	-0.26	U	-1.14	U
92Q1473	JBHS20L	-1.35	U	0.20	U	0.61	U	37.91	U	-0.13	U	-0.97	U

TOTAL RECOVERABLE METALS: (ppb)

92Q1472	JBHS10M	0.00	U	0.00	U	0.00	U	5.68	B	1.94	B	0.00	U
92Q1474	JBHS20L	0.00	U	0.00	U	0.00	U	4.48	U	1.77	B	0.00	U

TOTAL METALS: (ppm)

92S1475	JBHD10M	22.95	B	12.15	B	291.82	N	263.00	U	120.22	U	8.24	B
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QUEEN MINE

DISSOLVED METALS: (ppb)

92Q898	BQNS10L	-1.32	U	-0.34	U	2.00	U	14.91	B	0.47	U	-1.14	U
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LITTLE QUEEN MINE

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
--------	-----------	----	-----	-----	----	-----	-----	----	-----	-----	----	-----	-----

# DISSOLVED METALS: (ppb)

92Q881	FNPS10M	0.00	U		35.34	B		2.82	B				
92Q882	FNPS20M	0.60	B		29.25	B		3.88	B				
92Q883	FNPS30M	0.80	B		43.71	B		5.76	B				
92Q887	FNPS40L	-0.68	U		23.66	B		3.66					
92Q888	FNPS50L	-0.74	U		20.91	B		-0.77	U				
92Q880	FNPS60L	0.00	U		0.00	U		0.00	U				

# TOTAL RECOVERABLE METALS: (ppb)

92Q974	FNPS40L	0.00	U		26.27	B		45.97			0.07	B	
92Q975	FNPS50L	0.00	U		20.38	B		0.00	U		0.09	B	

# TOTAL METALS: (ppm)

92S889	FNPD10H	111.83			627.33			4949.94			194.75		
92S890	FNPD20H	0.00	U		0.00	U		0.00	U		0.11	B	

# B AND H MINE

# DISSOLVED METALS: (ppb)

92Q1471	JBHS10M	1.96	B		19.58	B		-0.59	U				
92Q1473	JBHS20L	0.82	U		19.89	B		-0.92	U				

# TOTAL RECOVERABLE METALS: (ppb)

92Q1472	JBHS10M	0.00	U		16.89	B		0.00	U		0.09	B	
92Q1474	JBHS20L	0.00	U		16.93	B		0.00	U		0.09	B	

# TOTAL METALS: (ppm)

92S1475	JBHD10M	1.82	B		83.92	B		649.93		N	2.87		
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# QUEEN MINE

# DISSOLVED METALS: (ppb)

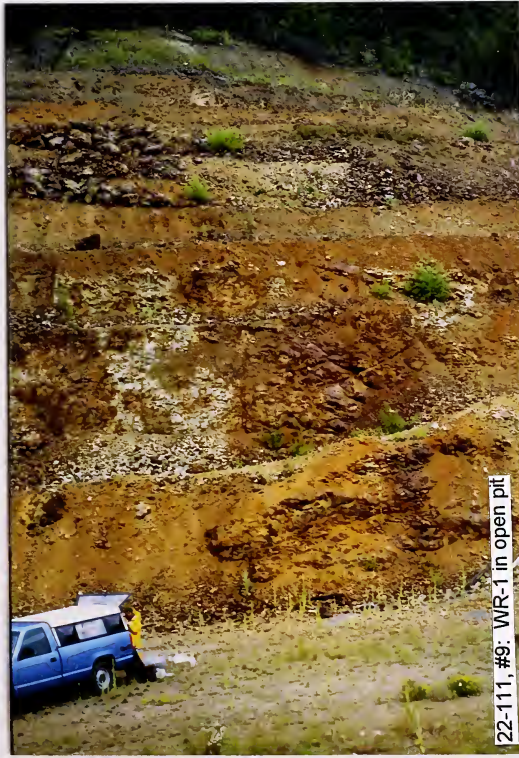
92Q898	BQNS10L	-0.83	U		0.86	U		0.28	U				
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# LITTLE QUEEN MINE

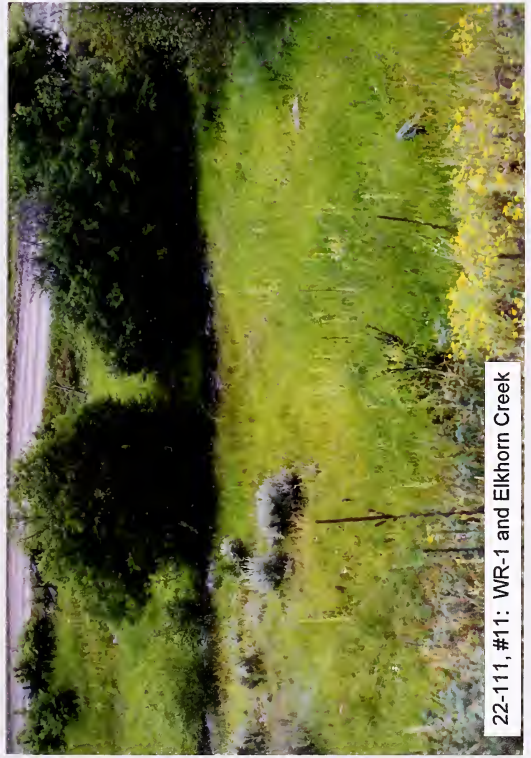




22-111, #10: WR-1 in open pit



22-111, #9: WR-1 in open pit



22-111, #11: WR-1 and Elkhorn Creek





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TACOMA PA#: 22-284

Date: August 16, 1993 Time: 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (65°F); partly cloudy;  
slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #5: Adit #1; #6:  
Adits #2 and #3; #7: WR-5; #8: WR-9. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Backfill  
open adits; recontour waste rock; seed.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TACOMA PA#: 22-284

Legal Description: T 6N ; R 3W ; Sec. 34 , NW1/4 NE1/4 1/4

County: JEFFERSON Mining District: ELKHORN

Latitude: N 46° 13' 58" Longitude: W 111° 57' 47"

Primary Drainage Basin and Code: Elkhorn Creek/10020006

Secondary Drainage Basin: Tacoma Gulch

USGS Quadrangle map name(s): Tacoma Park

Mine Type/Commodities: Hardrock/Gold, Silver, Lead

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Deerlodge National Forest

Relationship to other mines/sites in the area/district: The Elkhorn Queen site is located 2 miles to the northeast.

Regulatory Status (Activity by other agencies)? Hardrock permits?       
Past Reclamation Activities? N/A

General site features: Elevation 7000' , Slope 19° ,  
Aspect Southwest and east

Land use: Mining      , Recreational      , Residential      , Urban      ,  
Agricultural X , Other (Specify)     

Area of disturbed/unvegetated lands? 0.6 acres.  
Dimensions:     

Predominant vegetation types: Scrub pine

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites). No  
vehicle access up from Tacoma Gulch Road.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 4 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Contact of andesite and Cambrian Limestone is in dry valley down middle of site vein deposit. Site is divided by a dry intermittent drainage that drains to Tacoma Gulch in 1/4 mile.

Mining/milling history, ore type/tenor, host rock, gangue: Ore deposit was vein with quartz gangue, in some places iron-stained, with a concentration of galena on upper and lower surfaces. Ore was reported to carry considerable gold; production inclusive 1911 to 1940 was 89 tons of ore yielding 26 oz. Au, 694 oz. Ag, and 15,091 lbs. Pb.

#### Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 8, Comment 7 open  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

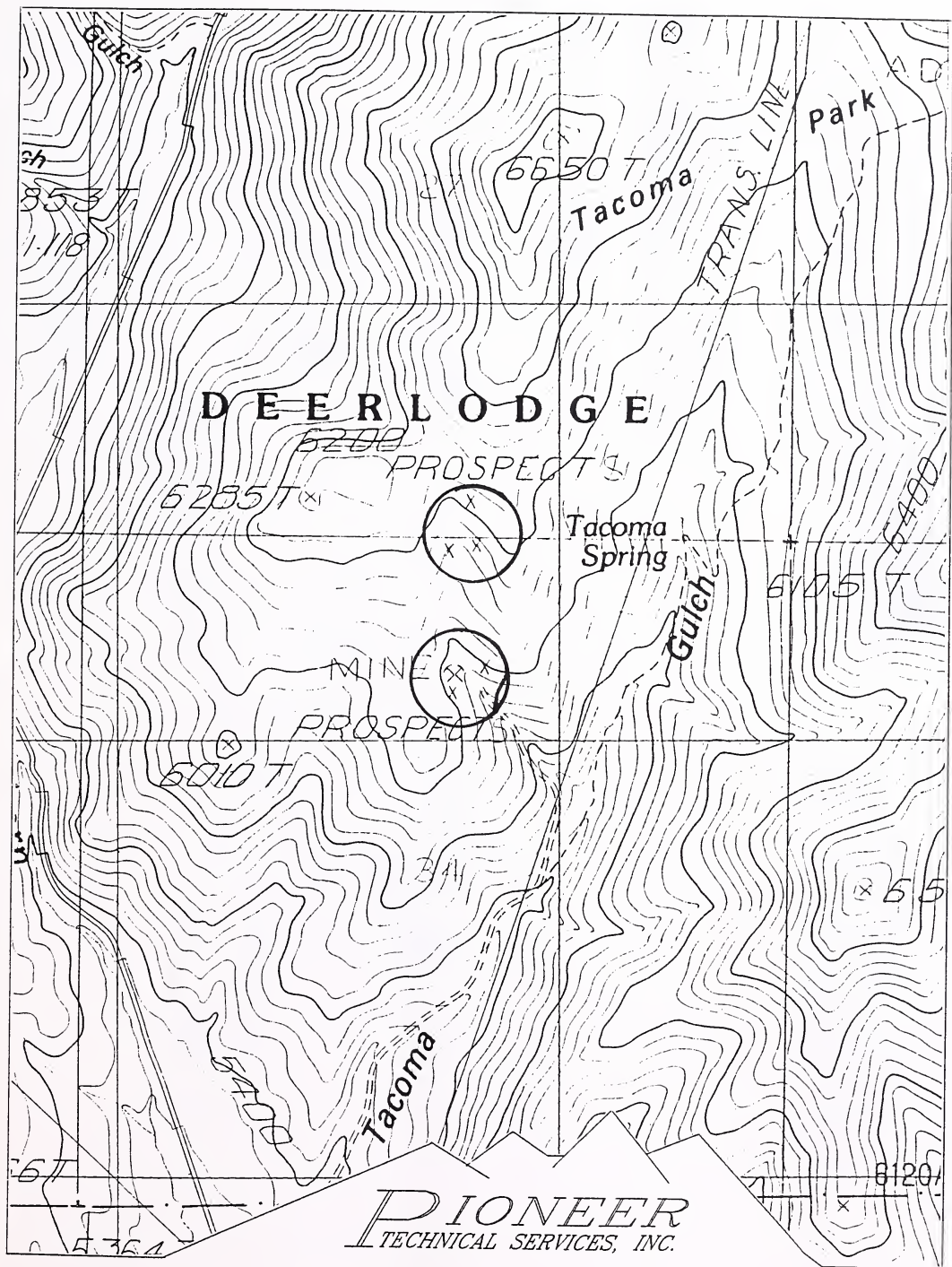
Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:5399	06N 03W 22 ABB	78.0	0.0	8.49
M:5401	06N 03W 22 ABB	18.0	0.0	6.47
M:5402	06N 03W 22 ABB	65.0	0.0	6.37
M:5400	06N 03W 22 ABB	18.0	0.0	6.97





**PIONEER**  
TECHNICAL SERVICES, INC.

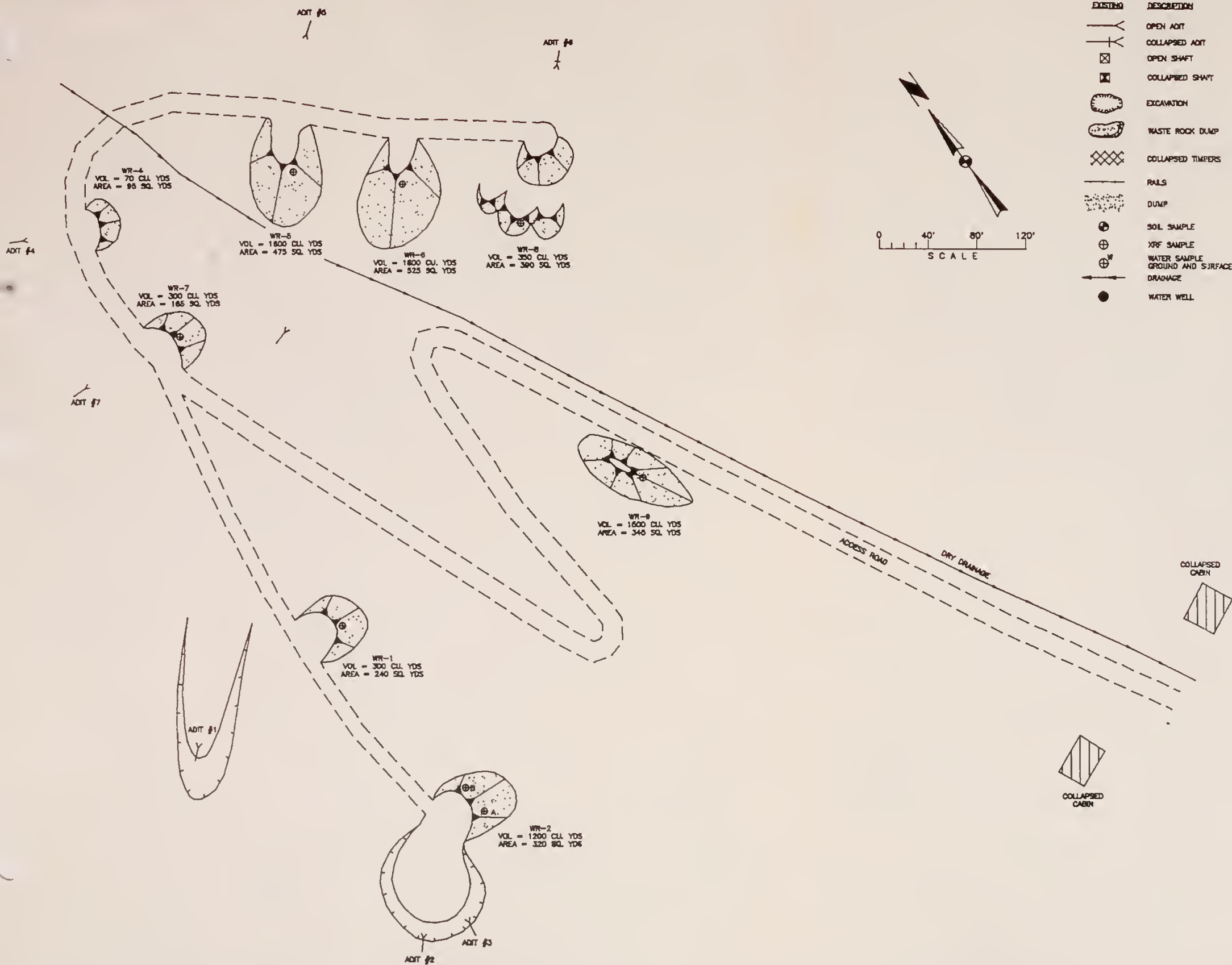
TACOMA, P.A. NO. 22-284

T06N, R03W, SECTION 34

SCALE: 1" = 1000'







MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

TACOMA PA# 22-284  
ELKHORH DISTRICT JEFFERSON COUNTY

SHEET NO.

**PIONEER**  
ENGINEERING CONSULTANTS  
GREAT FALLS - BOZEMAN - KALISPELL - SPOKANE

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
MONTANA  
GREAT FALLS - BOZEMAN - KALISPELL - SPOKANE

DRAWN: MWC DATE: 8/83  
DESIGNED: TBR JOB NO.: 92-17  
APPROVED: F.B. NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



# SOURCE INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	300	Upper bench by south end	None	6.8 (D)	0.045	22-284-WR-1	08/16/93 1200	T-Metals, ABA
WR-2A	WR	1,200	South end of dump midway down face	None	7.0 (D)	0.05			
WR-2B	WR		North end of dump approx. 10' from top	None	6.9 (D)	0.04			
WR-4	WR	70	Dump associated with Adit #4	None	NM	NM	N/A	N/A	N/A
WR-5	WR	1,500	Sample 5' from top southwest of Adit #5	None	6.8 (D)	0.03			
WR-6	WR	1,800	East side of dump	None	6.5 (D)	0.04			
WR-7	WR	300	Middle of dump approx. 15' up from bottom of drainage	None	6.6 (D)	0.04	22-284-WR-2	08/16/93 1210	T-Metals, ABA
WR-8	WR	350	South of collapsed adit approx. 50'	None	6.4 (D)	0.04			
WR-9	WR	1,500	North end off knob approx. 5'	None	6.9 (D)	0.04			
SS-1	BKGRND	N/A	Background soil 200 feet south of WR-2A	N/A	N/A	N/A	22-284-SS-1	08/16/93 0945	T-Metals

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-284-WR-1 is composite of WR-1, WR-2A and -2B, WR-5, and WR-6. 22-284-WR-2 is composite of WR-7 through WR-9. NM = Not Measured.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 12

Distance to nearest well used for drinking? 3 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible\_\_\_, Unlikely X.

Uncontained source with no shallow water.

Other observations/notes: N/A



## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes\_\_\_\_, No X, Name(s): \_\_\_\_\_

Dry streambeds: Yes X, No\_\_\_\_, Name(s): Unnamed dry intermittent drainage

Other surface water: Yes\_\_\_\_, No X, Name(s)/Description: \_\_\_\_\_

Waste materials within any floodplain: Yes X, No\_\_\_\_ Source ID(s): WR-9 is in dry drainage.

Approximate Flood frequency? \_\_\_\_1 yr, X 10 yr, \_\_\_\_100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

High Flow: \_\_\_\_\_, Average Flow: \_\_\_\_\_

Distance between waste source(s) and nearest surface water body (ft)? N/A

Surface water draining onto or through waste sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Wetland, fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_, No X, Distance downstream (ft)? \_\_\_\_\_ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

1

st

1

Y

or



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL(OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	2,160	1,296	No	None
WR-2	None	Dry	2,880	2,592	Yes	None, unless disturbed
WR-4	None	Dry	855	855	No	None
WR-5	None	Dry	4,275	4,190	No	None
WR-6	None	Dry	4,725	4,489	Yes	None, unless disturbed
WR-7	None	Dry	1,485	743	Yes	None
WR-8	None	Dry	3,510	3,335	Yes	None
WR-9	None	Dry	3,105	3,074	Yes	Low, unless disturbed

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Pop cans

Accessibility - Fences, warning signs, closed roads? Unrestricted; however, road to site is closed to vehicle traffic.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes X, No\_\_\_\_, Comment Adits

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium\_\_\_\_, Low Not Rated  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low Not Rated  
Fisheries Habitat and Species Classification - Not Rated  
Sport Fishery Classification - Not Rated

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 7, types and locations: Adit #1 (6'x4'); Adit #2; Adit #3; Adit #4, partially caved; Adit #5, partially collapsed (1'x3'); Adit #7 (4'x3'); Adit in side of drainage (2'x5').

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, p. 64.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Tacoma, Prepared by Northern Engineering and Testing, July 20, 1988.

MDSL/AMRB Files, Abandoned Mine Reclamation Portal Inventory Form for Tacoma, Prepared by Daphne Digrindakis, May 18, 1985.

USGS, Topographic Map, Tacoma Park, Montana, 7 1/2 minute Quadrangle, 1986.





LABORATORY ANALYTICAL DATA

TACOMA  
PA NO. 22-284



Tacoma PA# 22-284  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/16/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
22-284-WR-1	177 J	168 J	12.0 J	6.97	1.39 U	334	30200	0.507	900	2.66	23600 J	6.34 J	1530 J	NR
22-284-WR-2	35.2 J	158 J	3.9 J	7.67	2.09	25.4	19100	0.175	835	2.66 U	1320 J	6.45 U	859 J	NR
BACKGROUND	29.8 J	255 J	1.1 J	7.47	5.79	31.7	19700	0.038	1170	6.23	38.2 J	5.89 U	101 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL ACID/BASE 1/1000	NEUTRAL POTENT. 1/1000	SULFUR ACID/BASE POTENT. 1/1000	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR 1/1000	ACID/BASE POTENT. 1/1000
22-284-WR-1	0.03	0.94	14.3	13.3	0.02	<0.01	0.01	0.00	14.3
22-284-WR-2	0.01	0.31	42.8	42.5	<0.01	<0.01	0.01	0.00	42.8

LEGEND

WR1 - Composite of subamples WR1, 2A, 2B, 5, and 6.

WR2 - Composite of subamples WR7, 8, and 9.

BACKGROUND - From Tacoma (22-284-SS-1).



XRF ANALYSIS RESULTS

TACOMA  
PA NO. 22-284





Mine Name: Tacoma PA# 22-284

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrH	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-284-FE	585.254	25793.3	7838.4	1115.18	96.331	1784.66	32780.8		250.472	1185.69		79.7711
22-284-SS-1		17368.9	11093.2	2149.72		1539.81	21382.4			97.0928 *	77.739 *	365.96
22-284-WR2-A	437.576 *	32731.6	8105.4	1536.46		2092.26	20123.4		94.2046 *	1180.53		73.5664
22-284-WR2-B		28845.2	7508.09	1035.66		1163.03 *	32543.9		195.159 *	1172.44		71.0127
22-284-WR-1	585.254 *	25793.3	7838.4	1115.18		1784.66	32780.8		250.472	1185.69		79.7711
22-284-WR-1-COMP		23350.5	9443.41	1539.46		1457.96	31910.2		202.12	1826.71		139.664
22-284-WR-2-COMP		12553.9	30570.1	1279.3		1049.08 *	29827			3061.18		327.84
22-284-WR-5	262.178 *	25990.6	7371.58	1593.56		1716.12	30053		105.004 *	1635.07		128.571
22-284-WR-6	393.666 *	15668.9	19301	1340.28		1787.58	31471.6		280.938	2627.81		190.712
22-284-WR-7	423.423 *	17336	8509.59	2038.18		1079.15 *	27310.1			367.14		317.843
22-284-WR-8	288.187 *	9388.66	33419.4	1445.37		1861.11	25767.8		70.8806 *	5879.72		395.151
22-284-WR-9	360.203 *	11388.3	38796.9	1340.25		995.639 *	32207.8			144.105 *	47.4862 *	391.884
	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
22-284-FE	218.24	21.3342	6405.42	155.052	104.851		436.271	119.609		26.8524		
22-284-SS-1				103.442			629.218	67.7831 *		12.3213 *		
22-284-WR2-A	269.784		3110.63	156.852			1056.44	111.632 *		22.9381 *		
22-284-WR2-B	296.834	10.6457 *	2386.46	169.592			789.552	92.9184 *		15.9106 *		
22-284-WR-1	218.24	21.3342	6405.42	155.052			436.271	119.609 *		26.8524 *		
22-284-WR-1-COMP	186.098	36.8096	4029.07	152.179	153.459 *		508.108			26.7778 *		
22-284-WR-2-COMP	176.275			114.231			563.281			17.7537 *		
22-284-WR-5	188.98	14.3162 *	2224.42	160.478			617.74	107.479 *				
22-284-WR-6	132.163	39.1475	5588.52	151.259	143.521 *		380.77	183.504 *		35.993 *		
22-284-WR-7	186.258		1516.33	120.958			635.519	149.85 *		17.0568 *		
22-284-WR-8	154.099	25.2723	1656.12	99.0873			420.182	116.796 *		14.0403 *		
22-284-WR-9	110.467		21.125 *	60.9746			480.76			6.37976 *		

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

TACOMA  
PA NO. 22-284



# AIMSS SCORESHEET

SITE NAME:  
PA NUMBER:

TACOMA  
22-284

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	40
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	40
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	72.458
6		WELLS - 1 MI. x 2.5		10.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		8
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	18.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>52170</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	79.706
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	17
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>54200</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.624
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	30
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>3936</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.385
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	3
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>1073</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
	(LINES 10 + 24 + 35 + 44) / 100,000			1.11

LINE  
NO.

SITE NAME:

TACOMA

PA NUMBER:

22-284

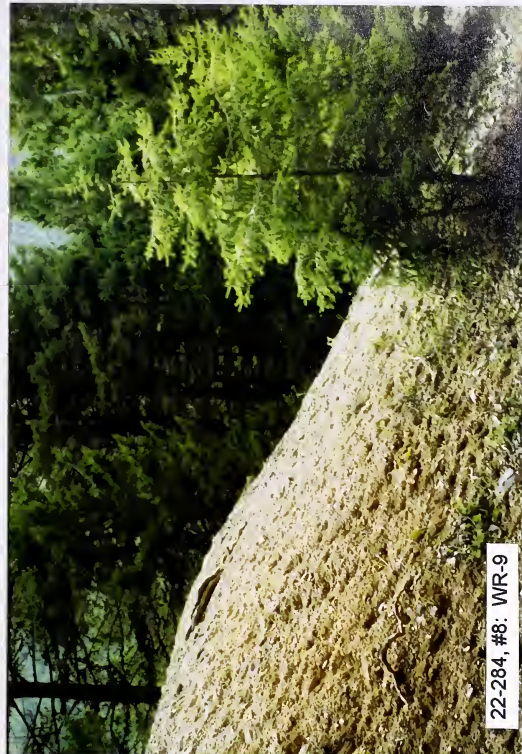
**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	350
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	350
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	3
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>21.00</b>





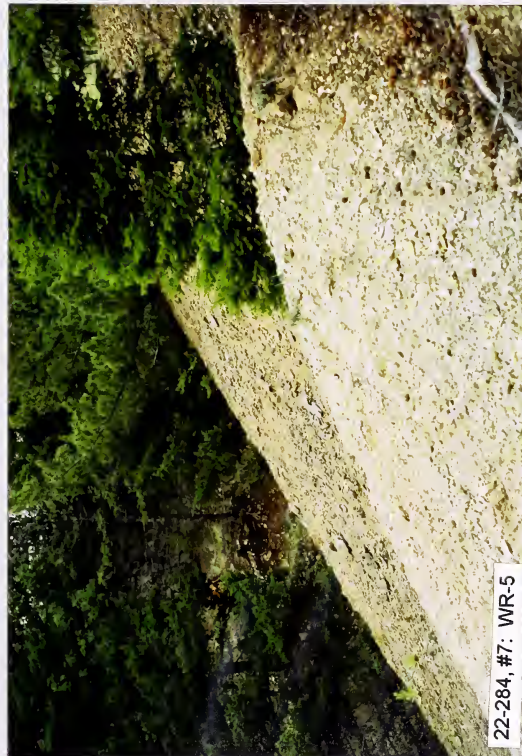
22-284, #6: Adit #2 and Adit #3



22-284, #8: WR-9



22-284, #5: Adit #1



22-284, #7: WR-5





**Jefferson County (Cont'd)**

Colorado (Cont'd)	Gregory	PA # 22-005
	Washington	PA # 22-007
	Argentine	PA # 22-102
	Minah Mine	PA # 22-104
Elkhorn	Wickes Smelter	PA # 22-358
	Elkhorn Queen	PA # 22-027
	Queen (Tourmaline)	PA # 22-111
	Tacoma	PA # 22-284
	Sourdough	PA # 22-336
High Ore	Comet Tailings	PA # 22-009
	Grey Eagle	PA # 22-029

Montana  
Jefferson County  
COP. No. 22-005  
Idaho, MT 59001

**Judith Basin County**

Hughesville	Block P Mine	PA # 23-001
	Marcelline	PA # 23-022
	Belt Patent	PA # 23-035
	NE NE S7 (Lucky Strike)	PA # 23-042
	Wright Lode	PA # 23-045
	Edwards Lode	PA # 23-046
	Harrison/Moulton	PA # 23-056
	Moulton	PA # 23-058
Yogo	Tiger	PA # 23-059
	Vortex	PA # 23-027
	NE NE S31	PA # 23-079



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: SOURDOUGH PA#: 22-336

Date: August 20, 1993 Time: 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer  
Lasher, Pioneer

Visitors: Paul Tietz, Geologist, Santa Fe Pacific  
Unidentified, Metallurgic Engineer,  
Santa Fe Pacific

Weather/Seasonality Observations: Warm (70°F); clear; slight  
breeze (< 5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #9: Adit discharge,  
SW-3 sample location and WR-5; #10: WR-4; #12: WR-3 in pit.  
Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Area is to become an active mine. A mill was constructed further  
downstream (1/2 mile) on Greyback Creek and never used.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Waste rock  
could be reprocessed or revegetation would be possible with  
coversoil. Adit discharge is near neutral pH; treatment may not be  
necessary. Move WR-5 back from creek or berm.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SOURDOUGH PA#: 22-336

Legal Description: T 6N ; R 3W ; Sec. 10 , NW1/4 SE1/4 1/4

County: JEFFERSON Mining District: ELKHORN

Latitude: N 46° 17' 00" Longitude: W 111° 57' 37"

Primary Drainage Basin and Code: Elkhorn Creek/10020006

Secondary Drainage Basin: Greyback Gulch

USGS Quadrangle map name(s): Elkhorn

Mine Type/Commodities: Hardrock/Iron, Gold

Activity Status: Active      , Inactive/Exploration X , Abandoned      .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Many Owners;  
Louise Rankin Galt, Box 615, Helena, MT 59624. (406) 442-8450;  
Louisa Rothfus, 2100 Oregon Avenue, Butte, MT 59701. (406) 723-  
8852; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Many  
mines are located in the Elkhorn District.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Exploration permit; no reclamation  
on-site.

General site features: Elevation 6600' , Slope Up to 42° ,  
Aspect North

Land use: Mining X , Recreational      , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 2 acres.  
Dimensions:     

Predominant vegetation types: Forested

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).       
Santa Fe Pacific has locked gate to site; must get permission.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 8 well logs within a 1 mile radius. An on-site monitoring well has a static water level of approx. 25 feet and a total depth of 180 feet; the well yields 60 gpm.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals): Greyback Creek flows east to west at the site. The site is underlain by both monzonite and limestone.

Mining/milling history, ore type/tenor, host rock, gangue: Mine was worked during the 1890's and again intermittently between 1904 and 1940. From 1904 to 1951, the mine produced 98,445 tons of ore yielding 23,868 oz. Au, 11,542 oz. Ag, and 650,549 lbs. Cu. Ore mined before 1911 averaged 40% Fe. Ore occurs at a contact of quartz monzonite and limestone; ore is in granite near a contact with metamorphosed limestone. Four types of veins are magnetite, hydrous ferric silicate, chalcopyrite intergrown with augite, and pyrrhotite and chalcopyrite in gangue of pyroxene.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 8, Comment 3 caved; 5 open  
Pits - Yes X, No     , # 2, Comment Result of collapsed adit  
Placers - Yes     , No X, #     , Comment       
Other - Yes X, No     , # 1, Comment Highwall

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

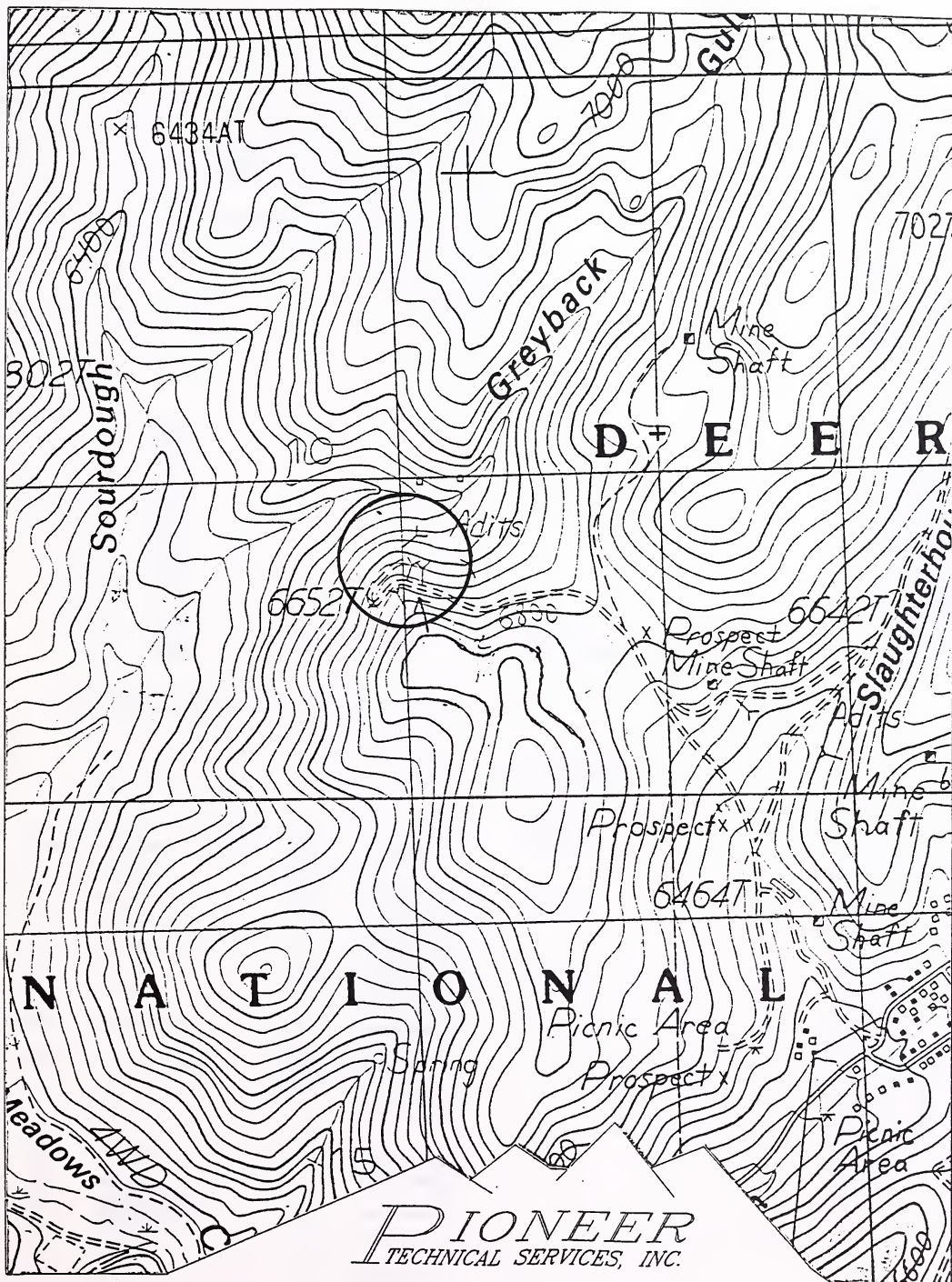


Montana Bureau of Mines and Geology  
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53335	06N 03W 11 CC	155.0	90.0	25.00
M:53336	06N 03W 11 CD	180.0	60.0	25.00
M:53337	06N 03W 14	110.0	20.0	20.00
M:53338	06N 03W 14 BA	185.0	99.0	170.00
M:53341	06N 03W 15	84.0	3.0	15.00
M:53340	06N 03W 15	64.0	30.0	10.00
M:53339	06N 03W 15	125.0	20.0	5.00
M:53342	06N 03W 15 DAC	27.0	1.0	15.00





**PIONEER**  
TECHNICAL SERVICES, INC.

SOURDOUGH, P.A. NO. 22-336

T06N, R03W, SECTION 10

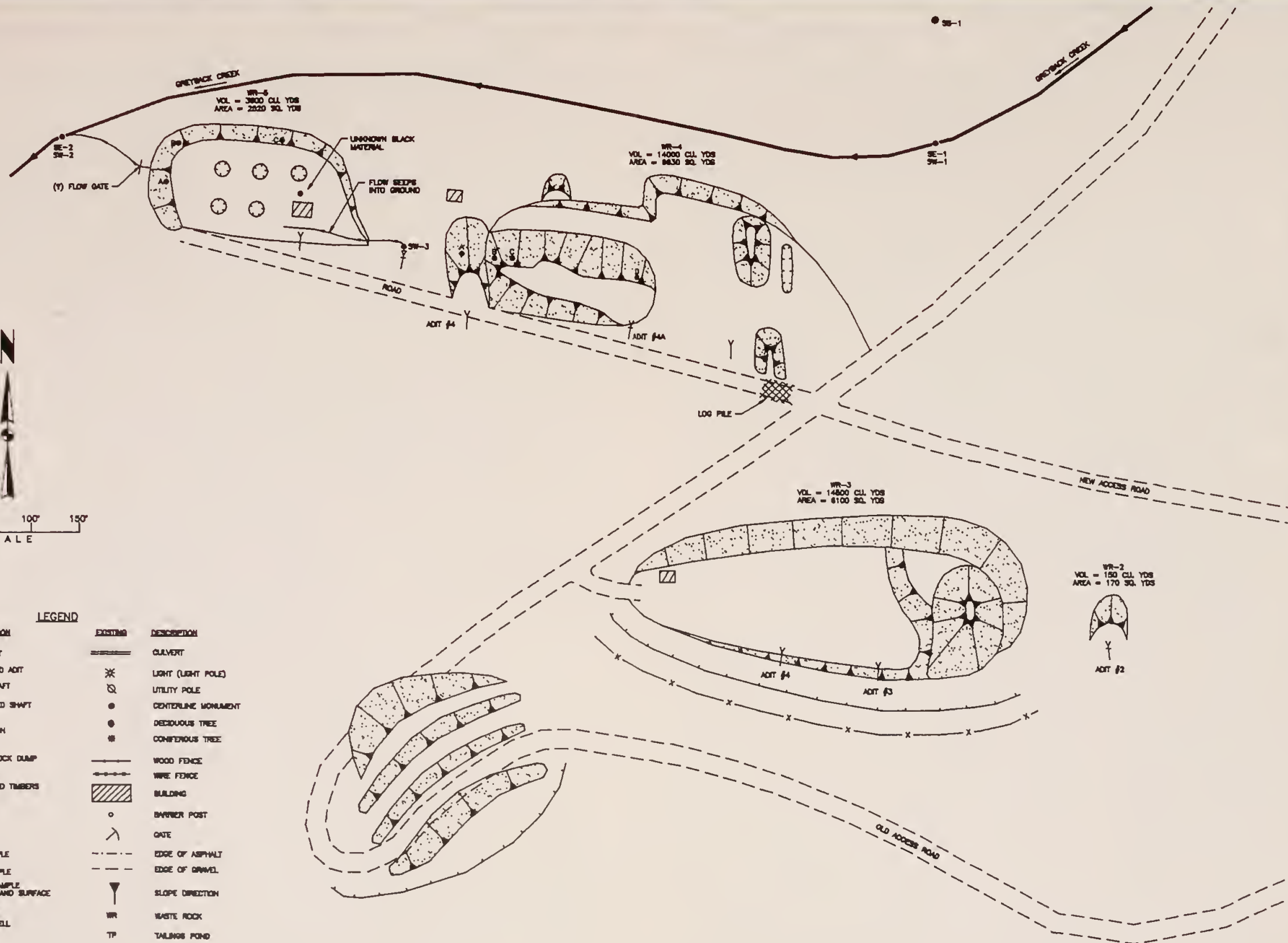
SCALE: 1" = 1000'





# LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	LAB SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE		EDGE OF ASPHALT
	GROUND AND SURFACE DRAINAGE		EDGE OF GRAVEL
	WATER WELL		SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

SOURDOUGH PA# 22-336  
ELKHORN DISTRICT JEFFERSON COUNTY

PIONEER  
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN: MWC DATE: 10/93  
DESIGNED: TPR JOB NO.: 93-17  
APPROVED: F.B. NO.

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





# SOURCE INVENTORY FORM

SAMPLERS: Flammanq, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S)*	RADIO-ACTIVITY (MR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-2	WR	150	Off of nose on north side	None	6.8 (D)	0.05	22-336-WR-1	08/20/93 2200	T-Metals, ABA
WR-3A	WR	14,500	Unknown	None	6.6 (D)	0.04			
WR-3B	WR		Unknown	None	6.8 (D)	0.03			
WR-4A	WR	14,000	Approx. 15' east of Adit #4; west lobe of peak	None	6.60 (D)	0.06	22-336-WR-2	08/20/93 2210	T-Metals, ABA
WR-4B	WR		Further east of Adit #4; off of knob	None	6.95 (D)	0.065			
WR-4C	WR		Lower part of WR-4 on west end near top on north side	None	5.80 (D)	0.05			
WR-4D	WR		North of Adit #4 on east end of WR-4	None	< 3.5 (D)	0.05			
WR-5A	WR	3,800	South side of east lobe of WR-5	None	6.25 (D)	0.04	22-336-WR-3	08/20/93 2220	T-Metals, ABA
WR-5B	WR		Northeast side of WR-5 approx. 25' above stream	None	6.80 (D)	0.045			
WR-5C	WR		East side of WR-5 approx. 25' above stream	None	6.65 (D)	0.035			
SS-1	BKGRND	N/A	Background soil on north side of Greyback Creek	N/A	NM	0.04	22-336-SS-1	08/20/93 1245	T-Metals
UNK-1	Unknown	N/A	North of tar papered building on WR-5	None	6.80 (D)	0.04	N/A	N/A	XRF Analysis

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-336-WR-1 is composite of WR-2, and WR-3A and -3B.  
 22-336-WR-2 is composite of WR-4A through -4D. 22-336-WR-3 is composite of WR-5A through -5C.  
 NM = Not Measured

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map.

Flowing adits: Yes X, No   , Number: 1 Identification: At WR-5

Filled shafts: Yes   , No X, Number:    Identification:   

Seeps/Springs: Yes   , No X, Number:    Identification:   

Groundwater wells within 4 miles?: Yes X, No   ;  
Number of well logs: 12

Distance to nearest well used for drinking? Approx. 1 mile to the town of Elkhorn.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite   , Probable   , Possible X, Unlikely   .

Uncontained sources; some elevated metal values in waste rock.

Other observations/notes: Well (GFMW-2) on the site has SWL of 25' and TD of 180'; pumping rate is 60 gpm.

**SAMPLERS: Babits**

[illegible]

Flow: Estimated (E) or Measured (M) from edit. shaft. zero or existing?

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):** NM = Not Measured

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No   , Name(s): Greyback Creek

Dry streambeds: Yes   , No X, Name(s):   

Other surface water: Yes X, No   , Name(s)/Description: Flowing adit at WR-5.

Waste materials within any floodplain: Yes X, No    Source ID(s): WR-5

Approximate Flood frequency? X 1 yr,    10 yr,    100 yr

Estimated seasonal flow of stream(s) (cfs)? 40 gpm

High Flow: 500 gpm, Average Flow: 45 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; WR-5 is in Greyback Creek.

Surface water draining onto or through waste sources: Yes X, No   , Describe: Adit discharge flows onto WR-5.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes   , No X, Distance downstream (ft)?    Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): None observed during this investigation.



## SAMPLERS: Babits

**FLOW: Estimated (E) or Measured (M)?**

MDSL AMRB/PIONEER 4/9/93

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 1-5 acres

Wetlands present: Yes X, No   , Describe: Streamside in narrow drainage

Carbonate rocks/soils: Yes X, No   , Describe: Hornfels host rock contains calcite.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10   ; 10-30 X; 30-100   ; 100-300   ; 300-1,000   ; 1,000-3,000   ; 3,000-10,000   ; 10,000 or greater   ; Comments   

Nearest residence(ft or miles)? 1.25 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
            observed      high      moderate      low      none



**SAMPLERS:** Babits, Flammanq, Lasher

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X  
Describe:

Population within 1 mile: 1-10\_\_\_; 10-30 X; 30-100\_\_\_; 100-300\_\_\_;  
300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or greater\_\_\_;  
Comments

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:

Accessibility - Fences, warning signs, closed roads? Closed roads  
after working hours (Tuesday through Friday).

**Sensitive environments on-site or adjacent to site:**

State or National Parks - Yes\_\_\_, No X, Comment\_\_\_\_\_

Wilderness Area - Yes\_\_\_, No X, Comment\_\_\_\_\_

T&E Species Habitat - Yes\_\_\_, No X, Comment\_\_\_\_\_

Bat Habitat - Yes X, No\_\_\_, Comment\_\_\_\_\_

Primary Drainage X ; Secondary Drainage ; No Information :

Riparian Habitat Quality - High\_\_\_, Medium X, Low\_\_\_  
Wetlands Frontage - High\_\_\_, Medium X, Low\_\_\_  
Fisheries Habitat and Species Classification - 5  
Sport Fishery Classification - 5

## G. SAFETY CHARACTERISTICS

## Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No     , Number 5, types and locations: At WR-3 (two), WR-4 (two), and WR-5

Hazardous structures: Yes X, No   , Number 2, types and locations: Mine building and tar paper building on WR-5.

Unstable highwalls, pits, trenches, slopes: Yes X, No     , Number     ,  
types and locations: Highwall above WR-2.

Unstable waste piles, impoundments, undercut banks: Yes X, No     ,  
Number 2, types and locations: WR-3 and -4 have steep, high,  
unvegetated slopes.

Fire and/or Explosion hazards: Yes X , No , Explain: Mine building

## **Bibliography**

- Gold Fields Mining, Analytical Data on Monitoring Wells Sampled from September 13, 1989 to May 11, 1992, Summary of Water Quality Analyses dated January 14, 1993.
- MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Sourdough, Prepared by Northern Engineering and Testing, October 12, 1988.
- USGS, Ore Deposits of the Helena Mining Region, Bulletin 527, Written by Adolph Knopf, 1913.
- USGS, Topographic Map, Elkhorn, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

SOURDOUGH  
PA NO. 22-336



Sourdough PA# 22-336  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 08/20/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
22-336-SE-1	5.72 U	14.9	1.1 UJ	2.01 J	11.9 J	7.9	6070	0.061	148	5.37 J	7.84 U	7.56 U	11.8	NR
22-336-SE-2	46.2	72.4	1.1 UJ	13.3 J	36.3 J	203	20000	0.104	606	19.6 J	16.8	7.56 U	72.3	NR
22-336-WR-1	560	25.1	0.8 UJ	14.6 J	5.76 J	750	13500	0.044	1030	12.9 J	36.2	5.69 U	249	NR
22-336-WR-2	535	29.9	1.0 UJ	18.3 J	7.18 J	701	51800	0.056	770	6.54 J	70.6	6.57 U	126	NR
22-336-WR-3	105	29.3	0.7 UJ	15.3 J	13.8 J	336	24900	0.848	640	14 J	32.7	4.96 U	173	NR
BACKGROUND	76.1	157	0.7 UJ	15.5 J	55.6 J	64.1	24500	0.118	1260	33.5 J	86.7	4.86 U	121	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE POTENTIAL 1/1000	NEUTRAL. POTENTIAL 1/1000	SULFUR ACID BASE POTENTIAL 1/1000	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENTIAL 1/1000	SULFUR ACID BASE POTENTIAL 1/1000
22-336-WR-1	0.02	0.62	79.8	79.2	0.01	0.02	0.31	79.5
22-336-WR-2	0.56	17.5	13.9	-3.5	0.06	0.12	1.87	12
22-336-WR-3	0.05	1.56	31.9	30.3	<0.01	0.04	0	31.9

WATER MATRIX ANALYSES

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
22-336-SW-1	3.33 J	5	2.57 U	9.7 U	6.83 U	1.55 U	50.3 J	0.12 U	8.77	12.7 U	1.55 U	30.7 U	7.57 U	65.4
22-336-SW-2	2.47 J	5.87	2.57 U	9.7 U	8.73 J	6.5 J	145 J	0.12 U	11.7	12.7 U	2.24	30.7 U	70.4	70.4
22-336-SW-3	8.82 J	2.01 U	8.6	148	6.83 U	1120 J	34000 J	0.12 U	7460	35.4	1.55 U	30.7 U	429	470

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
22-336-SW-1	99	< 5.0	11	< 0.05	NR
22-336-SW-2	80	< 5.0	7	< 0.05	NR
22-336-SW-3	684	< 5.0	467	0.31	NR

LEGEND

- SE1 - Upgradient approx. 300' from waste rock dump 4.  
SE2 - Downgradient approx. 50' from base of waste rock dump 5.  
WR1 - Composite of subsamples WR2, 3A, and 3B.  
WR2 - Composite of subsamples WR4A, 4B, 4C, and 4D.  
WR3 - Composite of subsamples WR5A, 5B, and 5C.  
BACKGROUND - North side of Greyback Creek.  
From Sourdough Mine (22-336-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Airlift discharge of waste rock dump 5.





**XRF ANALYSIS RESULTS**

**SOURDOUGH  
PA NO. 22-336**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-336-SS-1	233.287	22668.1	14956.8	3763.24	222.904 *	2309.5	38780.3		104.277 *	158.269	125.702 *	403.189
22-336-UNK-1	101.703	6047.93	8537.24	2121.96		1329.28	67743.4	607.924 *	1177.61	239.393	365.119	185.545
22-336-WR3-A	205.177	26150	10134.5	3413.31		1408.66	48486.2			86.4342 *	223.487	318.862
22-336-WR3-B	205.585	26294.9	10251.2	3555.07		1388.3	49166.1			85.5313 *	242.888	315.65
22-336-WR4-A	241.224	17582.9	8185.87	3868.95		1918.46	47686.9		88.0172 *	229.11	350.826	194.019
22-336-WR4-B	226.466	24509	18504.6	1686.89		2408.65	98827.9			102.756 *	183.543	135.143
22-336-WR4-C	147.361	23650	2491.53	2290.06		1086.05 *	33914.9		1395.52	475.72	1130.59	116.508
22-336-WR4-D	122.564	1940.57	26705.8	1405.92		637.87 *	194651		1137.9	262.175	1848.68	36.3261 *
22-336-WR5-A	121.469	12685.5	17039.3	2054.22		1043.29 *	126936		419.227	521.242	1336.1	81.8645
22-336-WR5-B	187.43	14827.4	23789.1	2528.54		1564.81	36928.8		48.4521 *	150.803 *	100.672 *	240.924
22-336-WR5-C	186.633	32556.2	7026.9	2380.08			38432.6		265.179	135.473 *	321.495	189.2
22-336-WR-1-COMP		12265 \$	89771 \$	1950 \$	163 \$	1471 \$	47334 \$		378 \$	329 \$	586 \$	108 \$
22-336-WR-2		15013	109851	1118.86		1830.49	31178		626.772	795.576	1974.97	155.353
22-336-WR-2-COMP		19327	21266.2	2425.05		1634.69	103187		757.332	292.989	994.475	125.753
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
22-336-SS-1	233.287			48.5388 *	135.443			532.449			15.6472 *	
22-336-UNK-1	101.703			230.093	42.9177 *			149.526		10.2721 *	10.6812 *	
22-336-WR3-A	205.177				162.218			671.349		14.0877 *	14.2718 *	
22-336-WR3-B	205.585				176.167			707.78	88.0071 *	13.3869 *	16.8368 *	
22-336-WR4-A	241.224		8.27049 *	35.0396 *	157.746			589.975	100.638 *	31.3292 *	13.8305 *	
22-336-WR4-B	226.466				207.525			383.996		14.9821 *	18.4006 *	
22-336-WR4-C	147.361			111.186	75.3371			375.003	89.5679 *	23.6523 *	14.5879 *	
22-336-WR4-D	122.564							32.8744 *	199.103 *	11.7884 *		
22-336-WR5-A	121.469				77.4419			268.708	122.334 *	10.6576 *		
22-336-WR5-B	187.43				124.131			493.768		15.7534 *	12.9622 *	
22-336-WR5-C	186.633			39.1665 *	262.191			867.341	77.8109 *	17.8936 *	13.9752 *	
22-336-WR-1-COMP	194 \$			83 \$	83 \$	66 \$		314 \$	115 \$		9 \$	
22-336-WR-2	225.979			102.925	85.6731			489.209	166.553 *		7.6037 *	
22-336-WR-2-COMP	220.048			68.2389 *	150.61			448.734		10.1725 *	11.6321 *	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

SOURDOUGH  
PA NO. 22-336





# AIMSS SCORESHEET

SITE NAME:

SOURDOUGH

PA NUMBER:

22-336

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	10.448
7	GW - TARGETS	WELLS - 1 TO 4 MI	20.0
8		NEAREST WELL	4
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			100301
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	11.376
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	0
19		FISHERY	10
20		RECREATION	0
21		IRRIGATION/STOCK	5
22		T & E SPECIES HABITAT	2
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			17
			135374
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	15
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	0.102
30		NEAREST RESIDENCE	10
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	10
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			20
			153
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF	ACCESSIBILITY	10
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	0.098
41	TARGETS	NEAREST RESIDENCE	10
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			10
			49
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		2.36

LINE  
NO.

SITE NAME:  
PA NUMBER:

SOURDOUGH  
22-336

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	250
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	405
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	10
13		SITE SAFETY SCORE	(LINES 1 x 8 x 12) / 1,000	40.50

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

*State law requires that this form be filed by the water well driller within 60 days after completion of the well.*

**DRILLER:** Please give this copy to the well owner to complete reverse side.  
**OWNER:** Complete reverse side and send to DWHC when the well is completed.







## SUMMARY OF WATER QUALITY ANALYSES

SUMMARY OF WATER CONSENT AGREEMENTS  
CEEP01 - Gold Fields. Elkhorn Proj - Gold Fields Permit

## Sample Type: Monitoring Wells

[illegible]

Abbreviations - TOT:Total; DIS:Dissolved; FRE:Free Cyanide; AWN:Amenable to Chlorination; EPT:EpTox; TCL:TCLP; E:Estimated, A:Anomalous Data

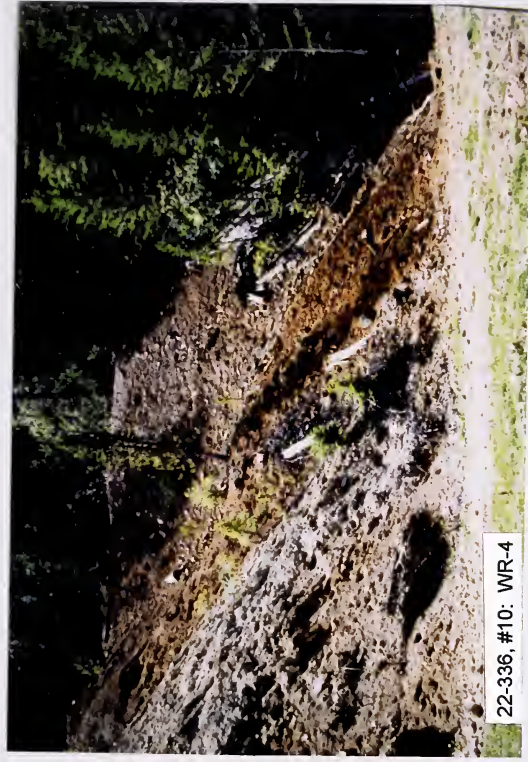


# SUMMARY OF WATER QUALITY ANALYSES

Sample Type: Monitoring Wells

[illegible]

Abbreviations - TOT: Total; DIS: Dissolved; TRC: Total Recoverable; FRE: Free Cyanide; AMU: Amenable to Chlorination; EPT: EpTox; E: Estimated, A: Anomalous Data. All quantities in mg/L (water) or mg/kg (Soil) unless noted. All results LABORATORY unless specified as field (FUD). Blank indicates parameter not tested.



22-336, #10: WR-4



22-336, #9: WR-5 and Adit discharge; SW-3 sample location



22-336, #12: WR-3 in pit



HIGH ORE



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: COMET PA#: 22-009

Date: July 8, 1993 Time: 0815-2100

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: Owner's representative that would not  
identify himself

Weather/Seasonality Observations: Warm (65°F); partly cloudy;  
slight breeze; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: Seep from  
diversion ditch from below; #8: Confluence of box culvert flow and  
seep in tailings; #9: Seep from ditch; #10: Settling pond; #11: TP-  
2, WR-2, and open pit, facing east; #12: Sluffing ditch wall; #14:  
SW-1, downgradient; #16: WR-2; #17: Ghost town; #18: Open pit; #21:  
Mill; #22: Bunkhouse/office; #23: Ghost town, north end; #24:  
Tailings, facing southwest; #26: WR-3, shaft, and location of GW-1  
and GW-2. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms):   
Reclamation project conducted by MDFWP is in need of repair  
and maintenance. The diversion ditch is about to fail in the area  
of a formerly observed shaft discharge due to a seep at the toe of  
the ditch fill. The sediment basin is approx. 90% full and  
ineffective. Design doesn't account for ice.

Higher than normal radiation readings observed in some of the  
tailings subsamples. Additional waste rock dump observed from the  
air east of open pit was not characterized during the 07/08/93  
investigation.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remedial  
design for this site will require additional characterization  
study. Extensive streamside tailings downstream from the mine site  
also need to be addressed during remedial planning.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): COMET PA#: 22-009

Legal Description: T 7N; R 5W; Sec. 36, S 1/2 1/4 1/4

County: JEFFERSON Mining District: BASIN/HIGH ORE

Latitude: N 46° 18' 37" Longitude: W 112° 10' 02"

Primary Drainage Basin and Code: Boulder River/10020006

Secondary Drainage Basin: High Ore Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active X, Inactive/Exploration X, Abandoned   .

Ownership status: Known YX N; private/public? Private

Owner, Agent, or Contact (include address and phone when available): Comet Group, Box 73, Boulder, MT 59632; Ledger Land Co., 8 First National Bank Building, Butte, MT 59701; Concorde Mines, Ltd., P.O. Box 519, Austin, TX 78767.

Relationship to other mines/sites in the area/district: Owners also owned or operated the Alta and Grey Eagle mines.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? Past reclamation conducted by MDFWP in 1990.

General site features: Elevation 6400', Slope 5° in drainage, Aspect Southwest

Land use: Mining X, Recreational X, Residential   , Urban   , Agricultural   , Other (Specify)   

Area of disturbed/unvegetated lands? Approx. 50 acres.

Dimensions:   

Predominant vegetation types: Lodgepole pine, Douglas fir, cottonwoods, aspen

Access: roads - good X, poor   , 4wd   , trail   .

Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius according to the MBMG September 8, 1993 database; however, it was learned that a new well has recently been drilled in the town of Comet.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Tailings and placer works lie within the High Ore Creek drainage, which flows west through the site. Mine workings lie on both the north and south sides of the creek. High Ore Creek flows west and then south to confluence with the Boulder River approximately 6 miles away. The site is underlain by the Boulder Batholith.

Mining/milling history, ore type/tenor, host rock, gangue: Production valued at \$13,000,000 prior to 1902. From 1911 to 1941, production was 42,443 oz. gold, 3,117,779 oz. silver, 2,235,676 lbs. copper, 28,535 lbs. lead, and 23,486,020 lbs. zinc. Ore bodies comprise stringers of sulfides and quartz separated by altered granite or altered grano-aplite. Sulfide minerals include galena, sphalerite, pyrite, chalcopyrite and arsenopyrite.

#### Mine Operation?

Shafts - Yes X, No    , # 2, Comment Headframe  
Adits - Yes X, No    , # 2, Comment Collapsed  
Pits - Yes X, No    , # 2, Comment Large open pits  
Placers - Yes X, No    , # 1, Comment Historic placer downstrm.  
Other - Yes    , No X, #    , Comment    

Mill Operation? Yes X, No    . If yes answer the next three questions:

Period(s) of Operation: 1880's to 1941, intermittently

Origin of Ore Milled - Custom Mill X Dedicated Mill    ; Number and names of mines that supplied mill feed: Grey Eagle and other unnamed mines

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? 1880's, concentrating plant 120 ton/day; 1926, 200 ton/day floatation mill. Concentrate was smelted at the Timber Butte Smelter located in Butte.



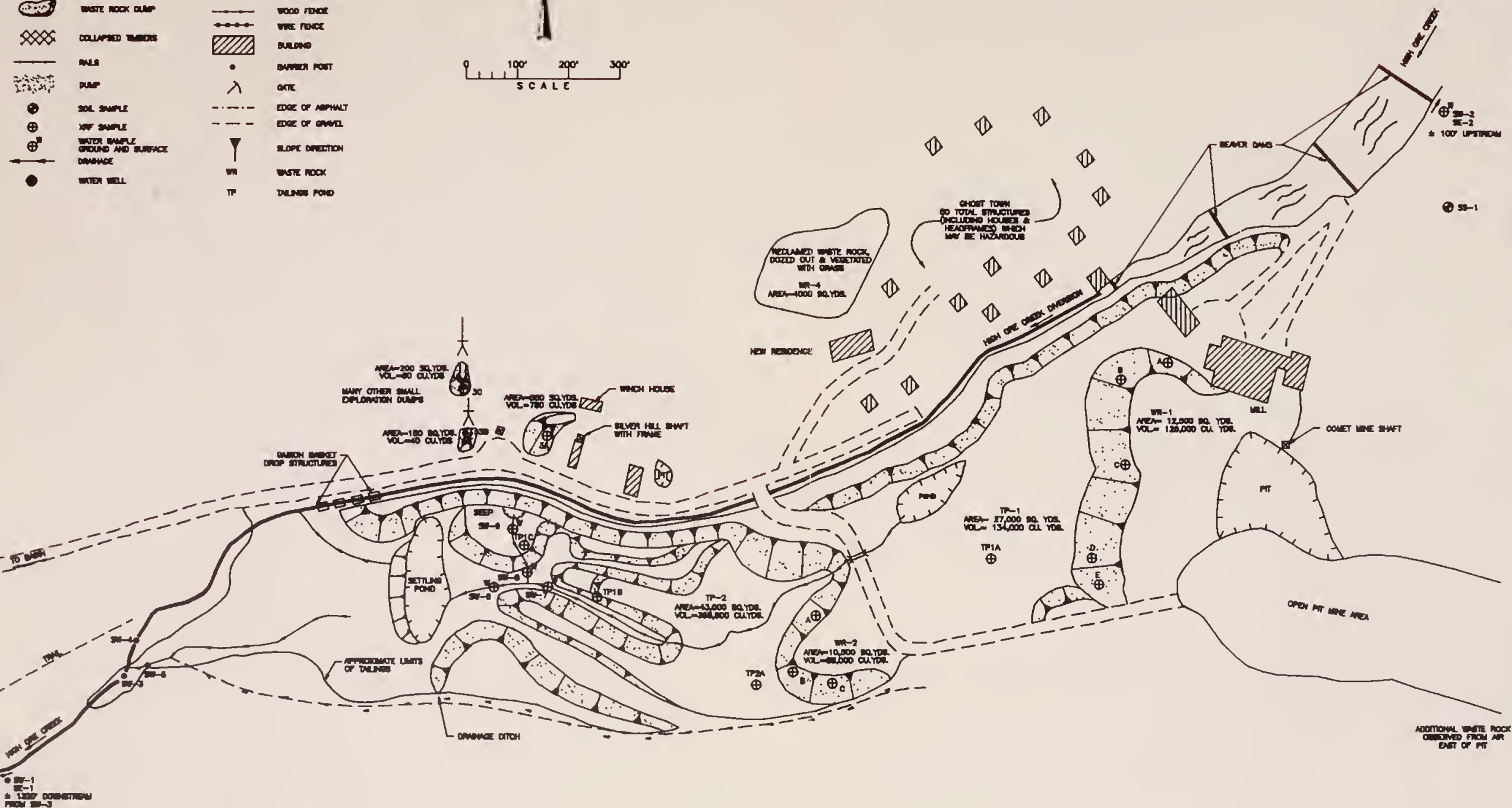




# LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	SOIL SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE		EDGE OF ASPHALT
	GROUND AND SURFACE DRAINAGE		EDGE OF GRAVEL
	WATER WELL		SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND

0 100' 200' 300'  
SCALE



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

COMET MINE/MILL PA# 22-009  
HIGH ORE DISTRICT JEFFERSON COUNTY

PIONEER  
ENGINEERING, INC.  
BOZEMAN, MONTANA

TDSH

DRAWN: MWC DATE: 8/23  
DESIGNED: TFR JOB NO. 22-17  
APPROVED: J.E. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Tailings range from fine sand to clay. \_\_\_\_\_

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Orange and white oxidized zones near surface and exposed cuts; gray unoxidized tailings are present typically at depths of 3 feet below surface. Tailings depths typically average 25 to 30 feet deep. \_\_\_\_\_

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Near surface, top tailings are dry; tailings are moist to wet 8 to 10 feet below ground surface in drainages. \_\_\_\_\_

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Impoundment was severely breached in past and settling pond at toe of former dam is full. \_\_\_\_\_

Comments on potential for mitigation: Further study and detailed remedial design. \_\_\_\_\_  
\_\_\_\_\_



# SOURCE INVENTORY FORM

SAMPLERS: Bullock\*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
TP-1A-A	TAIL	134,000	Upper tails, area between WR-1 and -2; 0'-1', orange/brown silt	Partially contained by WR-2	3.8 (D)	0.04	22-009-TP-1	07/08/93 1849	T-Metals, ABA
TP-1A-B	TAIL		1'-4', gray/green fine sand	Partially contained by WR-2	4.1 (D)	0.05			
TP-1A-C	TAIL		4'-9', gray wet silty sand; 9'-13', gray sand	Partially contained by WR-2	4.5 (D)	0.05			
TP-1A-D	TAIL		13', underlying soil	None	4.9 (D)	0.045	N/A	N/A	XRF Analysis
TP-1B-A	TAIL		In cut approx. 1/2 way through tailings; 0'-3', profile, orange/white clay	None	5.2 (D)	0.05	22-009-TP-3	07/08/93 1900	T-Metals, ABA
TP-1B-B	TAIL		7', gray fine sand	None	4.9 (D)	0.05			
TP-1B-C	TAIL		15', tan fine sand	None	6.0 (D)	0.04			
TP-1B-D	TAIL		25', gray silty sand	None	3.9 (D)	0.4			
TP-1B-E	TAIL		33', brown sand	None	4.4 (D)	0.075			
TP-1C-A	TAIL		Below seep area; 0'-3', profile, orange/white clay	None	5.0 (D)	0.04			
TP-1C-B	TAIL		10', gray clay	None	5.9 (D)	0.07			
TP-1C-C	TAIL		15', gray clay	None	6.2 (D)	0.1			
TP-2A-A	TAIL	350,500	Tailings near toe of WR-2; 0'-3', borehole, tan clay with iron stain	None	5.4 (D)	0.04	22-009-TP-2	07/08/93 1835	T-Metals, ABA
TP-2A-B	TAIL		3'-6', gray wet silty sand	None	5.8 (D)	0.05			
TP-2A-C	TAIL		6'-8.5', fine gray sand	None	6.0 (D)	0.045			
TP-2A-D	TAIL		8.5'-11', gray wet silt with sand	None	5.9 (D)	0.07			

\*Direct reading (alloy metal); †Detected Particulate (Olen Metal)

Comments or deviations from SOPs: 22-009-TP-1 is composite of TP-1A-A through -1A-1C. 22-009-TP-2 is composite of TP-2A-A through -2A-D. 22-009-TP-3 is composite of TP-1B-A through -1B-E, and TP-1C-A through -1C-C.

\*Continued on next page

**SAMPLERS: Belanger, Clark**      **SOURCE INVENTORY FORM (Cont'd)**

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	PH SU (D/S) <sup>*</sup>	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	125,000	Large upper new dump from pit, N side near mill; orange/brown sand	None	3.8 (D)	0.04	22-009-WR-1	07/08/93 1648	T-Metals, ABA
WR-1B	WR		NW corner on side; brown/gray/red sand	None	6.0 (D)	0.045			
WR-1C	WR		W side in gully; brown/yellow/white sand	None	5.7 (D)	0.04			
WR-1D	WR		E of WR-1E, W side, near top; brown/yellow sand	None	3.8 (D)	0.035			
WR-1E	WR		South end, 1/2 way down side; brown/orange/gray sand	None	3.6 (D)	0.06			
WR-2A	WR	88,000	Lower new dump from pit, N end; dark brown sand	None	5.6 (D)	0.045			
WR-2B	WR		Central; dark brown sand	None	5.8 (D)	0.045			
WR-2C	WR		S end; brown/orange sand	None	5.5 (D)	0.03			
WR-3A	WR	780	Collapsed adits dumps near Shaft #1; brown sand	None	3.8 (D)	0.05	22-009-WR-2	07/08/93 1711	T-Metals, ABA
WR-3B	WR	40	Collapsed adits dumps near Shaft #1	None	5.9 (D)	0.03			
WR-3C	WR	50	Collapsed adits dumps near Shaft #1; yellow sand	None	5.7 (D)	0.04			
WR-3D	WR		Collapsed adits dumps near Shaft #1; dark gray	None	6.2 (D)	0.04	N/A	N/A	XRF Analysis
WR-3E	WR		Shaft #1 dump; orange	None	4.9 (D)	0.04			
WR-3F	WR		Shaft #1 dump; gray	None	6.0 (D)	0.045	N/A	N/A	XRF Analysis
WR-4A	WR	N/A	Waste rock N of diversion, NW of mill; reclaimed area	None	5.5 (D)	0.035	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background soil	None	N/A	N/A	22-009-SS-1	07/08/93 1645	T-Metals

\* Direct reading (beta-gamma Meets); S-Saturated; P=Pot (Orion Meter)

Comments or deviations from SOPs: 22-009-WR-1 is composite of WR-1A through -1E, and WR-2A through -2C. 22-009-WR-2 is composite of WR-3A through -3C and -3E.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes    , No X, Number:     Identification:    

Filled shafts: Yes X, No    , Number:     Identification: Shaft #1 approx. 50 feet to water; another shaft west of Shaft #1 was reported to have a discharge during the original inventory, but could not be located.

Seeps/Springs: Yes X, No    , Number: 1 Identification: Water seeps out of the base of the diversion ditch fill material; parameters measured as SW-9.

Groundwater wells within 4 miles?: Yes X, No    ;  
Number of well logs: 15

Distance to nearest well used for drinking? Approx. 100 yds.  
upgradient, not yet in service at time of this investigation.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable X, Possible    , Unlikely    .

Tailings are in contact with groundwater (shallow alluvial) and contain elevated metal values. Waste rock is uncontained and also has elevated metal values.

Other observations/notes: N/A



**SAMPLERS:** Bullock, Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): High Ore Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): Tailings and placers below tailings area.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 2 during investigation  
High Flow: 5-10 cfs, Average Flow: 1 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Tailings and placer

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, agriculture in Boulder River

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? Approx. 6 mi. Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):  
Streamside tailings approx. 6 miles to confluence with Boulder River.

# **SURFACE WATER INVENTORY FORM**

SAMPLERS: Bullock, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mv	Temp °C	ALK. mg/L as CaCO <sub>3</sub>	Flow* cfs/gpm (M)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Downgradient approx. 0.25 mile down from end of reclaimed stream	7.32	369	96	12.0	59	2.007 cfs (M)	22-009-SW-1	07/08/93 1445	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-1	SE	Downgradient approx. 0.25 mile down from end of reclaimed stream	N/A	N/A	N/A	N/A	N/A	N/A	22-009-SE-1	07/08/93 1445	T-Metals
SW-2	SW	Upgradient approx. 300 feet above town	7.68	172	167	14.0	49	1.278 cfs (M)	22-009-SW-2	07/08/93 1633	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-2	SE	Upgradient approx. 300 feet above town	N/A	N/A	N/A	N/A	N/A	N/A	22-009-SE-2	07/08/93 1633	T-Metals
SW-3	SW	Junction of lined channel with old streambed through tailings	7.55	350	96	12.4	N/A	N/A	N/A	N/A	Field Parameters
SW-4	SW	End of lined channel	7.71	396	91	12.0	N/A	N/A	N/A	N/A	Field Parameters
SW-5	SW	End of old streambed through tailings	7.32	668	157	15.2	N/A	N/A	N/A	N/A	Field Parameters
SW-6	SW	Junction of two flows in tailings ponds	7.12	484	-038	12.0	N/A	N/A	N/A	N/A	Field Parameters
SW-7	SW	Flow from box culvert	7.12	383	-008	10.3	N/A	N/A	N/A	N/A	Field Parameters
SW-8	SW	Flow from ditch seep just above confluence	7.12	396	-096	12.0	N/A	N/A	N/A	N/A	Field Parameters
SW-9	SW	Ditch seep at origin	6.59	387	011	12.0	N/A	N/A	N/A	N/A	Field Parameters

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### AMD Characteristics:

### General Potential for AMD Mitigation:

Carbonate rocks/soils: Yes , No X , Describe:



# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Belanger, Clark

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL(OBSERVED/HIGH /MODERATE/LOW/NONE)
TP-1	SO3; pH	Partial	243,000	243,000	Yes	Moderate
TP-2	SO3; pH	Partial	387,000	387,000	Yes	Moderate
WR-1	SO3; FEOX; pH	Dry	112,500	112,500	No	None - Rock
WR-2	SO3	Dry	94,500	94,500	No	None - Rock
WR-3	SO3; pH	Dry	8,370	8,370	Yes	Low
WR-4	None	Dry	36,000	0	No	None

Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No     ,  
Describe: One residence in town

Population within 1 mile: 1-10 X; 10-30     ; 30-100     ; 100-300     ;  
300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ;  
Comments     

Evidence of recreational use on site: Yes X, No     , Describe: Off-  
road vehicle tracks; wood cutters present during investigation.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes     , No X, Comment       
Wilderness Area - Yes     , No X, Comment       
T&E Species Habitat - Yes     , No X, Comment       
Bat Habitat - Yes     , No X, Comment     

Primary Drainage     ; Secondary Drainage X; No Information     :

Riparian Habitat Quality - High     , Medium X, Low       
Wetlands Frontage - High     , Medium     , Low X  
Fisheries Habitat and Species Classification -      6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No     , Number     , types and locations:       
Shaft #1 is boarded up.

Hazardous structures: Yes X, No     , Number Many, types and locations:       
Mill building and approx. 37 old residences.

Unstable highwalls, pits, trenches, slopes: Yes X, No     , Number     ,  
types and locations: Large highwalls in pit area.

Unstable waste piles, impoundments, undercut banks: Yes X, No     ,  
Number 2, types and locations: Tailings are still actively eroding.  
Stream diversion ditch also may potentially fail.

Fire and/or Explosion hazards: Yes X, No     , Explain: Woode  
structures

## Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, September 8, 1993.

MDSL/AMRB, Application for Reclamation and Development Grant, Comet Mine Wetlands Development, Prepared by L.C. Hanson Company, May 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Comet, Prepared by Delta Engineering, Date Unknown.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

COMET  
PA NO. 22-009



Comet Tailings PA# 22-009  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/08/93

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils										Results per dry weight basis									
	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)						
22-009-SE-1	1670	150	19.3	17.4	4.7	224 J	18300	0.330	6060	4 J	1560	16	3670 J	NR						
22-009-SE-2	25	120	1.2	5.3	8.7	7.8 J	11300	0.025	992	6 J	33	8 U	62 J	NR						
22-009-TP-1	4790	224	17.7	16.1	1.8	324 J	39700	0.388	5860	6 J	1530	14	3010 J	NR						
22-009-TP-2	4640	205	13.0	10.8	3.3	434 J	33900	0.975	7440	3 J	2210	26	1900 J	NR						
22-009-TP-3	3400	239	20.1	12.6	3.3	445 J	32500	0.674	8550	2 U	2670	31	3020 J	NR						
22-009-WR-1	1610	153	36.4	8.1	1.6	248 J	24500	1.59	3930	4 J	3750	13	6060 J	NR						
22-009-WR-2	1260	65.0	23.6	5.0	1.5	245 J	23100	0.543	6100	3 U	2590	25	3720 J	NR						
BACKGROUND	137	265	3.0	6.7	4.6	35.9 J	12100	0.019	1280	6 J	84	7 U	227 J	NR						

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Required

Acid/Base Accounting

FIELD ID	TOTAL				SULFUR				PYRITIC				SULFUR			
	TOTAL %	SULFUR %	ACID BASE %	POTENTIAL	TOTAL %	ACID BASE %	POTENTIAL	NEUTRAL %	TOTAL %	ACID BASE %	POTENTIAL	NEUTRAL %	TOTAL %	ACID BASE %	POTENTIAL	NEUTRAL %
22-009-SS-1DUP	0.02	0.62	7.23	6.61	<0.01	0.01	0.01	0.31	0.01	0.01	0.01	0.31	0.01	0.01	0.01	6.92
22-009-SS-1	0.02	0.62	7.41	6.78	0.01	<0.01	0.01	0	0.38	108	37.9	7.41	0.38	108	37.9	7.41
22-009-TP-1	2.96	92.5	146	53.8	<0.01	0.4	1.34	14.9	0.18	14.9	37.8	14.9	0.18	14.9	37.8	14.9
22-009-TP-2	1.92	60	79.7	19.7	0.4	0.99	0.37	30.9	0.22	30.9	73.2	0.22	30.9	73.2	0.22	30.9
22-009-TP-3	1.84	57.5	104	46.6	0.57	0.37	4.22	11.6	0.24	11.6	29.5	0.24	11.6	29.5	0.24	11.6
22-009-WR-1	1.18	36.9	41.1	4.22	0.39	0.52	0.69	16.2	0.69	16.2	29.1	0.69	16.2	29.1	0.69	16.2
22-009-WR-2	1.6	50	45.3	-4.6												

WATER MATRIX ANALYSES

FIELD ID	Metals in Water										Results in ug/L									
	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC.						
22-009-GW-1	13.4 J	44.4	7.87	9.7 U	6.83 U	57 J	39.9	0.038 U	455	12.7 U	6.51 J	30.7 U	1870	286						
22-009-GW-2	11 J	45.5	8.37	9.7 U	6.83 U	63.2 J	22.4	0.130 J	440	12.7 U	6.51 J	30.7 U	2110	288						
22-009-SW-1	56.7 J	27	7.03	9.7 U	6.83 U	20.8 J	429	0.042 J	1240	12.7 U	25.3 J	30.7 U	2020	129						
22-009-SW-2	4.19 J	29.5	2.57 U	9.7 U	6.83 U	1.55 U	209	0.038 U	43.7	12.7 U	7.89 J	30.7 U	7.57 U	54.8						

Wet Chemistry

FIELD ID	Results in mg/l									
	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE					
22-009-GW-1	327	< 5.0	69	< 0.05	NR					
22-009-GW-2	354	< 5.0	70	< 0.05	NR					
22-009-SW-1	194	< 5.0	70	< 0.05	NR					
22-009-SW-2	101	< 5.0	8	< 0.05	NR					

LEGEND

SE1 - Downgradient approx. 0.25 mile from the end of reclaimed stream.  
SE2 - Upgradient approx. 300 feet above town.  
TP1 - Composite of subsamples TP1A-A, -B, -C.  
TP2 - Composite of subsamples TP2A-A, -B, -C, and -D.  
TP3 - Composite of subsamples TP1B-A, -B, -C, -D, -E, and TP1C-A, -B, -C.  
WR1 - Composite of subsamples WR1A, 1B, 1C, 1D, 1E, 2A, 2B, and 2C.  
WR2 - Composite of subsamples WR3A, 3B, 3C, and 3D.  
BACKGROUND - From the Comet Mine (22-009-SS-1).

SS1 - Background sample.  
GW1 - Silver Hill shaft #1.  
GW2 - Duplicate of sample 22-009-GW-1.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Required





**XRF ANALYSIS RESULTS**

**COMET  
PA NO. 22-009**

CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-009-TPIA-A	9773.16	33664.3	443.453	165.145 *	5617.2	30190.1		196.151	1162.1	3126.53	49.2224
22-009-TPIA-B	17649.5	46141.2	449.283 *		9004.08	36170.1		369.777	2783.73	3680.03	79.5575
22-009-TPIA-C	6460.57	16541.7	261.743 *		4037.71	19077.6		164.999	2420.79	3122.79	19.3577
22-009-TPIA-D	4095.08	9284.11	340.355 *	223.908 *	1729.11	20240.2		470.097	11555	270.588 *	99.1435
22-009-TPIB-A	4429.54	13949	122.421 *	158.544 *	1071.12	24663.4		334.739	1888.51	3539.33	30.5872
22-009-TPIB-B	6198.66	13437.3	316.199 *		6574.66	19460.8		193.827	1299.12	2728.44	28.0579
22-009-TPIB-C	6815.32	21714.9	469.536		4701.88	19476.9		240.727	2597.09	2983.75	46.3543
22-009-TPIB-D	10619	27432.7	361.066 *		8386.87	31135.1		364.645	2638.61	3294.81	55.4857
22-009-TPIB-E	8308.69	13740.9	231.831 *		13910.2	24398		763.32	4708.17	3120.76	31.0906
22-009-TPIC-A	8425.19	15162.4	293.868 *		12890.1	23439.4		145.821 *	786.695	2838.7	41.0829
22-009-TPIC-B	18750.7	43054.3	451.324 *		8197.16	28546.6		213.857	1891.15	2104.95	72.3922
22-009-TPIC-C	23354.4	24448.2	635.884		9602.76	26200.8		178.868 *	902.215	1628.75	70.5758
22-009-TPIA-B	18618.4	9434.02	310.017 *		4725.29	28870.9		346.484	539.212	4170.03	34.5356
22-009-TPIA-C	20062.8	18218.5	284.71 *		11561.7	34885.1		566.305	1955.87	5861.01	59.4321
22-009-TPIA-D	4786.69	27161.9	234.599 *	141.968 *	9348.45	20770.8		202.237	1816.12	2059.66	41.9
22-009-TPIA-E	19988.1	26220.1	566.222		8020.96	28207.4		331.774	1869.78	2966.31	56.849
22-009-TP-1-COMP	13397.8	38411	313.927 *		7015.89	32507.6		305.956	2162.38	3895.2	49.2342
22-009-TP-2-COMP	17115.2	17799.4	315.298 *		7368.12	27472.1		304.684	1349.12	3945.15	44.7413
22-009-TP-3-COMP	18035.4	30131.5	480.555		9071.58	28803.2		347.977	2235.3	3162.53	51.8532
22-009-WR1-A	29913.3	18019.9	1711.61		2889.52	31653.5		438.369	5741.91	2647.84	220.904
22-009-WR1-B	47318.1	14013.9	1318.95		2296.62	16977		95.5369 *	1074.74	734.794	72.172
22-009-WR1-C	25823.2	15065.4	1125.79	162.926 *	5036.18	29456.2		543.21	8800.23	4394.02	107.52
22-009-WR1-D	30094.3	10970.9	949.189	171.546 *	4081.85	26059.1		511.79	7612.97	2036.96	89.9838
22-009-WR1-E	43131.4	6135.52	891.659	185.355 *	8850.17	20884.8		132.546 *	9873.45	1771.65	58.7859
22-009-WR2-A	33308.9	17517.72	2006.15		2087.82	24114.9		278.062	915.741	242.722	242.722
22-009-WR2-B	17547.6	27313.8	924.19		14240	56950.7		418.87	10255.1	1495.06	166.359
22-009-WR2-C	28212.3	12984.1	1533.14	143.304 *	1579.16	22015.6		132.945 *	304.023	437.865	249.68
22-009-WR3-A	37093	12376.2	1097.84		2212.58	18625.7		52.436 *	857.503	602.193	213.92
22-009-WR3-B	44797.2	6822.4	1097.81		15765.1	12428.3			1714.15	134.755 *	25.2354
22-009-WR3-C	36431	7034.01	604.774		495.764 *	36319.6		261.129	593.667	2028.3	52.0527
22-009-WR3-D	46475.8	6840.15	980.724	144.14 *	15876.9	12253.8		57.8568 *	1789.28	147.685 *	27.329
22-009-WR3-E	32265.7	12959.8	931.611	168.219 *	1863.32	20610.9		505.477	3310.56	505.477	78.579
22-009-WR3-F	39481.2	17570.7	900.252	155.971 *	7456.97	17358.3		410.981	5305.43	69.9786 *	52.5629
22-009-WR4-A	17280.5	11697.7	2996.49		1295.05	26518.5			70.2516 *		587.34
22-009-WR-1-COMP	31970.3	15711.6	1083.63		6972.56	28117.2		273.153	6512.14	1363.43	144.192
22-009-WR-2-COMP	34783.4	8409.89	855.908		6894.83	20254.9		134.674 *	2446.56	920.541	65.8863

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-009-TP1A-A	38.6801	44.0142 *	16.9516 *	1490.62	109.015			226.187	107.246 *	29.6953 *	
22-009-TP1A-B	34.1278	27.0453	1458.05	158.481	158.481			389.177	93.852 *	43.174	
22-009-TP1A-C	40.737	33.1688	771.688	47.2704	59.1063			99.621	118.366 *	17.0325 *	17.4657 *
22-009-TP1A-D	58.8326		6122.26	1743.67	62.1313			158.583	11.7748 *	11.7748 *	10.8752 *
22-009-TP1B-A	37.933	34.4399	732.231	173.67	58.0375			183.674	46.3866	13.8935 *	
22-009-TP1B-B	30.5559	17.687	732.231	66.276	52.3099 *			136.275	13.8935 *	258.267	
22-009-TP1B-C	50.4025	34.409 *	14.8535 *	1710.45	64.1918 *			152.031	144.307 *	117.004	16.2062 *
22-009-TP1B-D	41.7352		113.145	2458.32	53.4755 *			113.98	9.67593 *		
22-009-TP1B-E	40.5487		53.6618	1704.63				135.202			
22-009-TP1C-A	46.4153		23.236	852.949	86.8139			115.972		22.899 *	
22-009-TP1C-B	45.7807		37.3409	2029.1	163.95			308.048		56.1022	
22-009-TP1C-C	48.516		29.7525	1388.55	239.075			156.525		63.7828	14.754 *
22-009-TP2A-A	36.3078		39.2741	1731.05	195.231			80.2036	99.3401 *	57.6761	10.1311 *
22-009-TP2A-B	32.9922		35.0953	2885.34	181.903			199.271	127.311 *	30.7127 *	
22-009-TP2A-C	42.3936		23.0564	1160.17	46.9468			149.204	88.9707 *	27.5692 *	
22-009-TP2A-D	49.8133		37.0939	2055.33	149.194			357.399	132.862 *	93.2356	
22-009-TP-1-COMP	41.4101	52.4194 *	27.8235	1057.4	92.1384			209.761	50.2726	30.6725 *	
22-009-TP-2-COMP	36.0582		33.0052	1946.84	147.887			193.868	140.094 *	68.1961	10.9693 *
22-009-TP-3-COMP	43.1734		44.5409	1928.18	129.35			270.558	137.184 *	14.8333 *	
22-009-WR1-A	139.43	42.8371 *	11.8335 *	3630.86	220.976			652.509			
22-009-WR1-B	128.668	50.5204 *	7.16258 *	834.928	319.848			354.204			
22-009-WR1-C	106.045	34.5242 *	8.11161 *	2803.51	193.638			406.194			
22-009-WR1-D	114.317		5.75302 *	2406.53	250.827			438.501		11.5115 *	13.2154 *
22-009-WR1-E	135.325	45.2319 *		880.685	382.68			345.358			
22-009-WR2-A	150.779	38.5396 *		3173.24	237.524			628.929			13.0424 *
22-009-WR2-B	114.946		20.7371 *	4594.65	191.777			646.089			20.812 *
22-009-WR2-C	139.474			469.934	229.942			1018.27			15.2159 *
22-009-WR3-A	143.566			494.249	299.588			454.656			14.4012 *
22-009-WR3-B	112.421	31.7221 *		551.09	409.784			52.7218 *			16.7205 *
22-009-WR3-C	98.9604	63.1419 *	7.47536 *	61.96.21	286.465			62.7465 *	239.513 *		14.0259 *
22-009-WR3-D	117.141			564.796	418.156			46.0981 *			16.0403 *
22-009-WR3-E	117.199			998.572	276.914			213.84			11.2478 *
22-009-WR3-F	90.8766		51.3176	425.927	334.69			118.021		28.5251 *	18.9101 *
22-009-WR4-A	190.003			19.2886 *	150.173			791.485			10.6145 *
22-009-WR-1-COMP	152.063		8.68081 *	2546.55	253.584			428.049			19.1009 *
22-009-WR-2-COMP	100.828		8.01081 *	1816.99	317.946			226.529			16.4783 *

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

COMET TAILINGS  
PA NO. 22-009





**AIMSS SCORESHEET**

SITE NAME:

COMET

PA NUMBER:

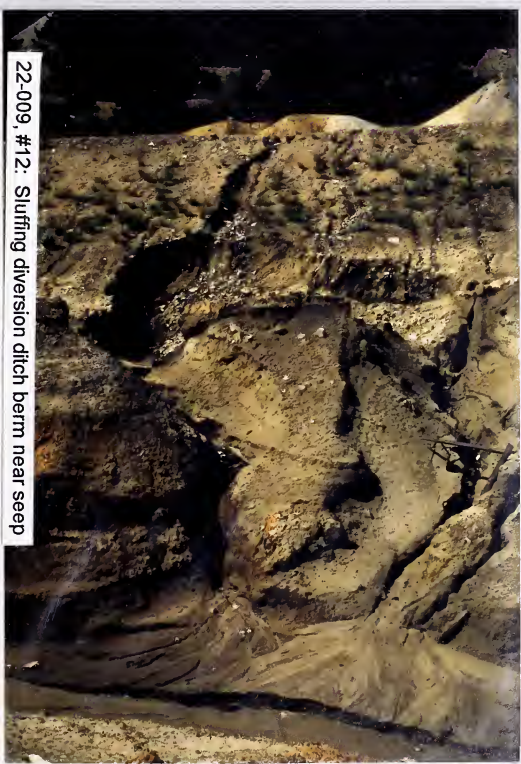
22-009

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2986.391
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		14
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	21.5
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>25682963</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3124.835
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		3
18	SW - TARGETS	WETLANDS		0
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	10
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>24998680</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	25.019
29		POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	21
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>157620</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	350
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	23.900
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	21
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>175665</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
	(LINES 10 + 24 + 35 + 44) / 100,000			<b>510.15</b>

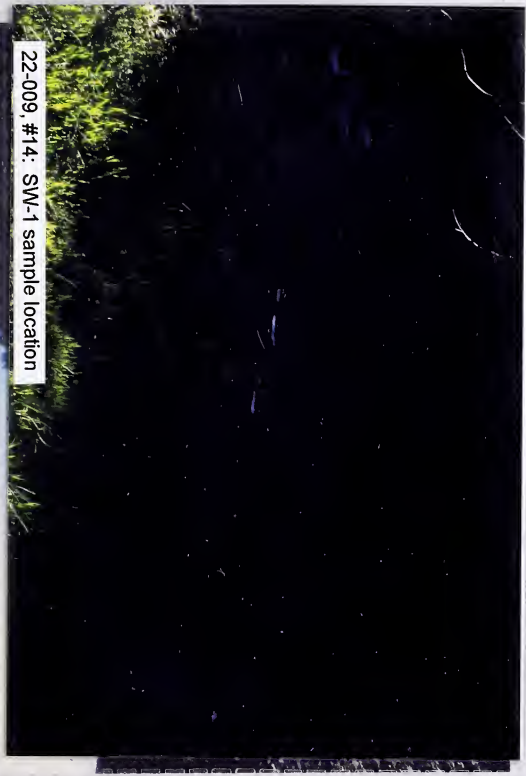
LINE NO.				SITE NAME:	COMET
				PA NUMBER:	22-009
	<b><u>SITE SAFETY</u></b>				
1	THREAT	ACCESSIBILITY			5
2		OPEN SHAFTS	100 EA.		100
3		OPEN ADITS	50 EA.		0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		1480
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 - 7		1655
9		POPULATION - 1 MILE			1
10	TARGETS	NEAREST RESIDENCE			10
11		RECREATIONAL USE			10
12		TARGETS SCORE	SUM LINES 9 - 11		21
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>173.78</b>



22-009, #11: TP-2, WR-2 and open pit, facing east



22-009, #12: Sluffing diversion ditch berm near seep



22-009, #14: SW-1 sample location



22-009, #16: WR-2

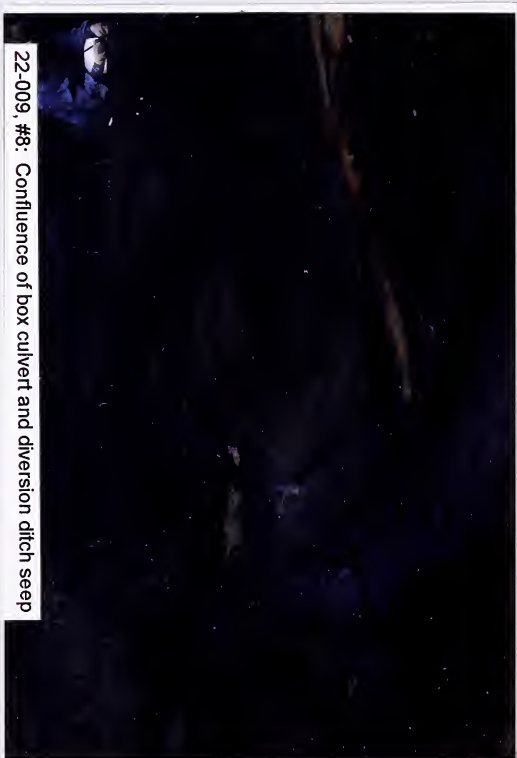




22-009, #7: Seep flowing from diversion ditch



22-009, #9: Seepage at base of diversion ditch



22-009, #8: Confluence of box culvert and diversion ditch seep



22-009, #10: Settling pond at end of tailings



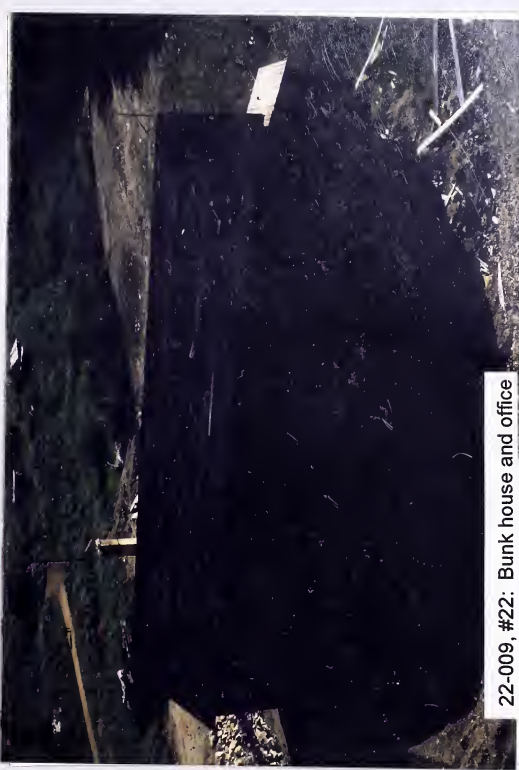
22-009, #17: Ghost town



22-009, #18: Open pit

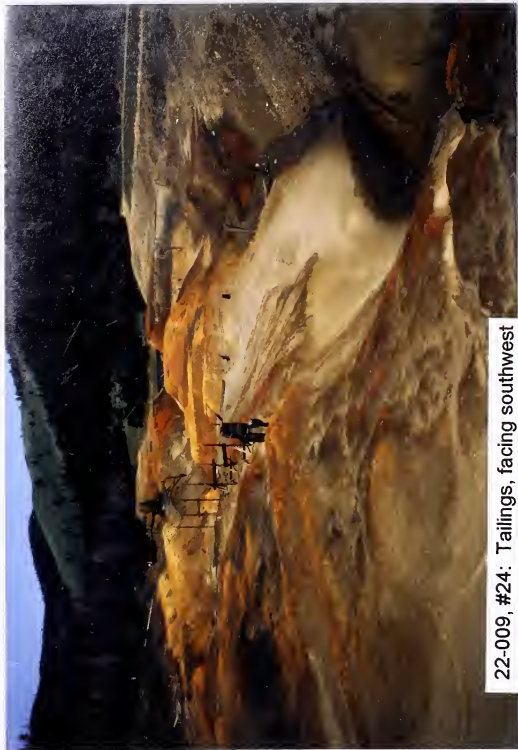


22-009, #21: Mill Building



22-009, #22: Bunk house and office





22-009, #24: Tailings, facing southwest

Comet Tailings  
22-009  
#18



22-009, #23: North end of ghost town



22-009, #26: WR-3 and shaft; GW-1 and 2 sample locations

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: GREY EAGLE PA#: 22-029

Date: July 9, 1993 Time: 1050-1400

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; calm; warm; cool,  
wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #27: Adit; #28: WR-1  
from toe looking north; #29: SW-1; #30: SW-2; #31: WR-2; #32: WR-1  
looking east. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site by truck. The adit associated with waste rock  
dump #1 does have water in it, but is not discharging. Field  
water quality parameters were within normal ranges; therefore,  
the water was not sampled. Literature indicates four adits  
associated with the mine; only two were located and sampled based  
on the inventory form and sketch. Small explorations noted in  
area which may have been the additional two adits.  
Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Grade, amend,  
and revegetate mine wastes.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GREY EAGLE PA#: 22-029

Legal Description: T 7N ; R 5W ; Sec. 35 , SW1/4 1/4 1/4

County: JEFFERSON Mining District: BASIN/HIGH ORE

Latitude: N 46° 18' 52" Longitude: W 112° 12' 00"

Primary Drainage Basin and Code: Boulder River/10020006

Secondary Drainage Basin: Bishop Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Silver, Lead, Copper, Zinc, Gold

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private

Owner, Agent, or Contact (Include address and phone when available): Cumberland

Resources, Inc., c/o North Lily Mining Co., 111 Bayhill Drive,

Suite 210, San Bruno, CA 94066. (415) 742-0133; Ledger Land Co.,

8 First National Bank Building, Butte, MT 59701.

Relationship to other mines/sites in the area/district: Ore was shipped to Comet mill (22-009); Bishop Creek drains into High Ore Creek; power lines run through site.

Regulatory Status (Activity by other agencies)? Hardrock permits?

Past Reclamation Activities? N/A

General site features: Elevation 6580' , Slope Avg. 15° , Aspect West

Land use: Mining X , Recreational X , Residential      , Urban      , Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? Approx. 2 acres.

Dimensions:     

Predominant vegetation types: Aspen, sage and brush, Douglas fir, grasses

Access: roads - good X , poor      , 4wd      , trail      .

Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). The site is located 3/4 mile downstream  
of the headwaters of Bishop Creek, a tributary to High Ore Creek  
which flows into the Boulder River. Site is underlain by quartz  
monzonite.

Mining/milling history, ore type/tenor, host rock, gangue: Mine  
was originally developed prior to 1905 and suspended in 1941. Ore  
was transported to the Comet for milling. Formed along a zone of  
fractures in quartz monzonite; most of the ore bodies consist of  
galena, sphalerite, and pyrite with a gangue of quartz and a  
manganese-bearing carbonate. It also contains gold and silver.

Mine Operation?

Shafts - Yes     , No X, #     , Comment                       
Adits - Yes X, No     , # 1, Comment Collapsed; no discharge  
Pits - Yes     , No X, #     , Comment                       
Placers - Yes     , No X, #     , Comment                       
Other - Yes     , No X, #     , Comment                     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



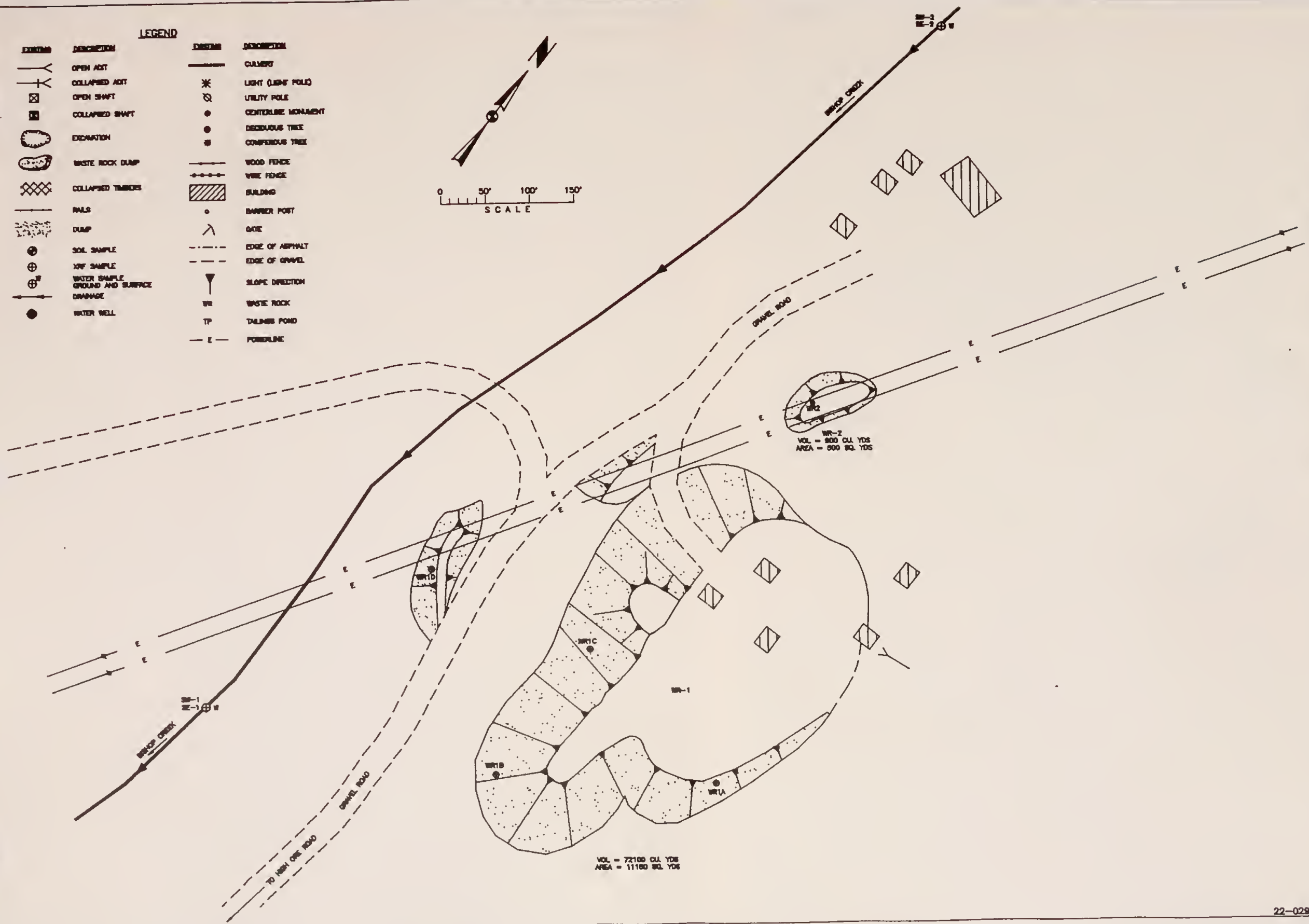
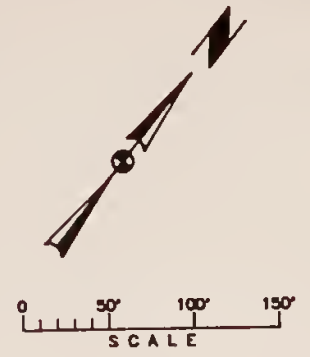
SCALE: 1" = 1000'





# LEGEND

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LAMP) POLE
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	SOIL SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE GROUND AND SURFACE		EDGE OF ASPHALT
	DRAINAGE		EDGE OF GRAVEL
	WATER WELL		SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND
			POWERLINE



<p><b>PIONEER</b> ENGINEERING CONSULTANTS</p>	<p>DATE: 8/93 JOB NO.: 22-17 F.B. NO.:</p>	<p>THOMAS, DEAN &amp; HOSKINS INC. ENGINEERING CONSULTANTS GREAT FALLS - BOZEMAN - KALISPELL MONTANA WASHINGTON</p>
	<p><b>TDSH</b></p>	
<p>MONTANA DEPT. OF STATE LANDS HAZARDOUS MATERIAL INVENTORY</p>		
<p>GRAY EAGLE MINE PA# 22-029 HIGH ORE DISTRICT JEFFERSON COUNTY</p>		
<p>22-029.DWG SHEETS</p>		<p>SHEET NO.</p>





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Bullock

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 22-029-WR-1 is composite of WR-1A through -1D. High radiation reading in WR-1.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Not flowing at this time; however, has pooled water.

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 5 miles?: Yes X, No    ;

Number of well logs: 15

Distance to nearest well used for drinking? Residences approx. 2.5 miles down High Ore Creek may have wells.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Flow from adit has occurred in the past; iron-staining is present.

Metal values in dumps are elevated.

Other observations/notes: N/A

**SAMPLERS:** Belanger

[illegible]

FLOW: Estimated (E) or Measured (M) from edit, abct, samp or strng?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Bishop Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes X, No     , Name(s)/Description: Small amount of pooled water at adit associated with WR-1.

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.57 during investigation  
High Flow: 2.0 cfs, Average Flow: 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? 3 feet between WR-1 and Douglas Creek.

Surface water draining onto or through waste sources: Yes     , No X,  
Describe: Historically, the adit discharged and flowed across WR-1, although the adit was not discharging during this investigation.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, wetland, possible residential use

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Very limited erosion of WR-1; majority of sediment probably caused by the clear cutting and grazing in the area.

**SAMPLERS:** Belanger

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



Evaluate each source in table on next page.

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

Area available for treatment (acres)? 20 acres

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes X, No     , Describe: Some manganese-bearing carbonate rocks are present.

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000 X; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments\_\_\_\_\_

Nearest residence(ft or miles)? Approx. 2.5 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none

# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Belanger

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Human tracks; litter

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium X, Low\_\_\_\_  
Fisheries Habitat and Species Classification - 3  
Sport Fishery Classification - 3

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 11, types and locations: Adit doghouse and cabins on WR-1; house and three cabins located northwest of mine; and, structure leading to entrance of adit (collapsed) associated with WR-1.

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Wooded structures

## Bibliography

- MBMG, Grey Eagle Group, Form 39, 1983, 1985-1987.
- MBMG, Mineral Information File 90.0, Grey Eagle Mine, Jefferson County, Basin Mining District.
- MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDSL/AMRB Files, Abandoned Mine National Inventory, Phase II Problem Area Data Sheet, Prepared by Mundie and Pederson, July 1, 1981.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Grey Eagle, Prepared by Delta Engineering, Date Unknown.
- MDSL/AMRB Files, Basin Montana Tunnel Company Information Sheet, Date Unknown.
- USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.



LABORATORY ANALYTICAL DATA

GREY EAGLE  
PA NO. 22-029





Grey Eagle PA# 22-029  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-029-SE-1	63 JX	62.9	1.4	4.4	5.9	43.3	9470	0.013 J	817 J	4	266	12 J	361	NR
22-029-SE-2	7 JX	57.3	0.6 U	4.1	7.5	7.1	10500	0.01 U	557 J	5	14	8 UJ	32	NR
22-029-WR-1	265 JX	491	4.1	7.4	1.1 U	503	13900	0.411 J	1840 J	6	722	14 J	859	NR
BACKGROUND	137	265	3.0	6.7	4.6	35.9 J	12100	0.019	1280	6 J	84	7 U	227 J	NR

U - Not Detected J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			SULFUR		
	TOTAL SULFUR %	ACID BASE %	POTENT. %	NEUTRAL. %	POTENT. %	ACID BASE %	ORGANIC %	SULFUR %	PYRITIC %	ACID BASE %	POTENT. %	SULFUR %
22-029-WR-1	1.74	54.4	84.2	29.8	0.51	0.72	0.51	22.5	61.7			

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-029-SW-1	2.31	22.6	2.57 U	9.7 U	6.83 U	4.23 J	187 J	0.038 U	29.6 JX	12.7 U	9.88 JX	90.7 U	26.8 J	46.4
22-029-SW-2	1.69 U	21.9	2.57 U	9.7 U	6.83 U	2.9 J	159 J	0.038 U	16.6 JX	12.7 U	5.77 JX	30.7 U	13.3 J	32.4

U - Not Detected J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-029-SW-1	129	< 5.0	17	< 0.05	NR
22-029-SW-2	97	< 5.0	8	< 0.05	NR

LEGEND

SE1 - Downgradient of waste rock dumps on Bishop Creek.  
SE2 - Upgradient of waste rock dumps on Bishop Creek.  
WR1 - Composite of subsamples WR1A through 1D.  
BACKGROUND - From the Comet Tailings (22-009-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.



**XRF ANALYSIS RESULTS**

**GREY EAGLE  
PA NO. 22-029**



Mine Name: Grey Eagle PA# 22-029  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-029-WR1-A		14166.6	33456.2	2432.28		3630.15	2897.4		182.817	1084.8	52.8493 *	234.063
22-029-WR1-B		37469.1	9082.35	700.735	194.564 *	263.045 *	19077.2		72.4084 *	324.524		50.5301
22-029-WR1-C		22488.2	13949.8	267.478 *	197.68 *	2971.38	12812.4		595.722	285.307	534.78	35.2092
22-029-WR1-D		15196.3	59333.2	741.645	170.598 *	4791.53	24152.6		432.707	1317.51	101.246 *	109.859
22-029-WR-1-COMP		25207.4	14775.9	505.108 *	206.305 *	2760.77	16105.4		237.213	547.646	232.339	74.4754
22-029-WR-2		39446.1	9936.44	1396.52		1087.63	10772.4			88.8145 *		57.7243
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
22-029-WR1-A	159.263			454.866	132.934			433.957	91.3348 *	26.6939 *	21.1806 *	
22-029-WR1-B	119.818	31.8544 *	8.37394 *	780.242	327.209			248.141		21.0525 *	19.9278 *	
22-029-WR1-C	52.5247		4.53929 *	137.057	204.354			2205.36		52.7684	21.5984 *	
22-029-WR1-D	97.6502		8.72829 *	694.286	121.921	141.65 *	67.7857 *	118.067	115.046 *	21.909 *	8.2901 *	
22-029-WR-1-COMP	82.1527		8.34293 *	361.188	218.323		48.966 *	1122.03		39.637 *	17.6699 *	
22-029-WR-2	185.973	39.7091 *		49.3837 *	285.821			181.224		25.1971 *	26.4176	

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

GREY EAGLE  
PA NO. 22-029





# **AIMSS SCORESHEET**

SITE NAME:

GREY EAGLE

PA NUMBER:

22-029

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B 200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 23.261
6	GW - TARGETS	WELLS - 1 MI. x 2.5	0.0
7		WELLS - 1 TO 4 MI	15
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 15.0
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 69783
<b>SURFACE WATER PATHWAY</b>			
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 25.407
16	SW - TARGETS	DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	10
19		FISHERY	5
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 391268
<b>AIR PATHWAY</b>			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 50
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.847
29	AIR - TARGETS	POPULATION - 4 MILES	300
30		NEAREST RESIDENCE	0
31		WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33 310
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 13129
<b>DIRECT CONTACT PATHWAY</b>			
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.775
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	5
43		TARGETS SCORE	SUM LINES 40 - 42 5
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 581
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000		
			4.75

LINE  
NO.

SITE NAME:

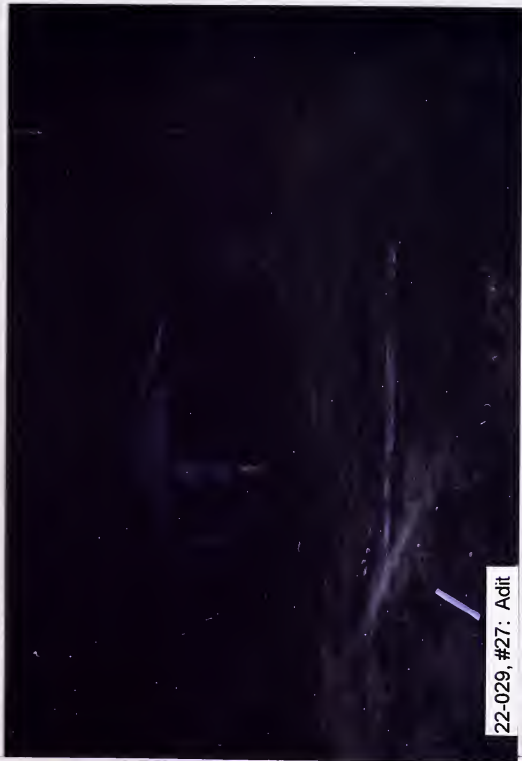
GREY EAGLE

PA NUMBER:

22-029

SITE SAFETY

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	(
3		OPEN ADITS	50 EA.	.0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	440
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	440
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>44.00</b>



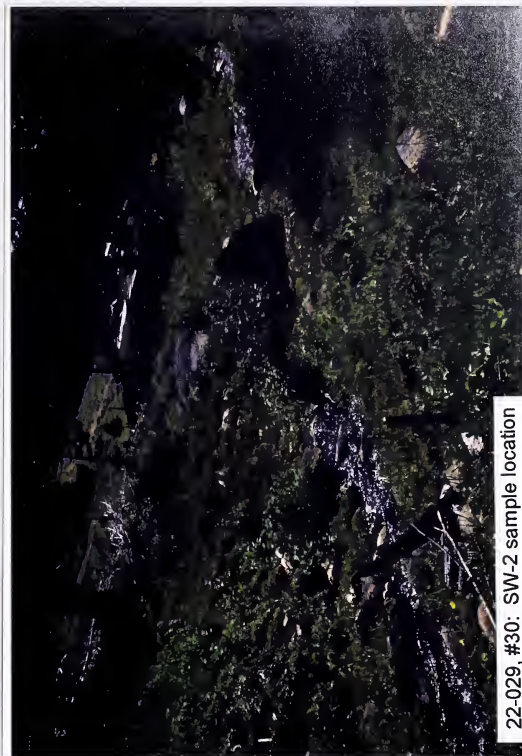
22-029, #27: Adit



22-029, #28: WR-1



22-029, #29: SW-1 sample location



22-029, #30: SW-2 sample location





22-029, #31: WR-2



22-029, #32: WR-1 and structure











MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BLOCK P MINE PA#: 23-001

Date: June 7, 1993 Time: 0830

Field Team Leader: Bullock, Babits; Pioneer

Sampling Personnel: Flammang, Lasher, Clark;  
Pioneer  
Pierson; TD&H

Visitors: None

Weather/Seasonality Observations: Rainy; cold (35°F); breezy. It  
rained during the previous night and through the entire sampling  
investigation.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): \_\_\_\_\_

General Comments/Observations (not covered specifically in attached Inventory Forms):  
The Block P Tailings were not investigated by Pioneer because of  
extensive studies previously conducted; however, upgradient and  
downgradient surface water and sediment samples were collected  
along Galena Creek and corresponding tributaries to determine the  
impact. Sampling of Galena Creek was done based on sample  
locations from previous sampling conducted by MDSL/AMRB (Chen-  
Northern.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove waste  
from creek/drainage area or divert the water. Reclaim by removing  
or topsoiling spoils and dismantle and dispose of debris. Block or  
backfill shaft. Study additional water treatment alternatives.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BLOCK P MINE PA#: 23-001

**Legal Description:** T 15N ;R 9E ;Sec. 7 , NE1/4 NW1/4 1/4

County: JUDITH BASIN                      Mining District: HUGHESVILLE

Latitude: N 47° 05' 01" Longitude: W 110° 37' 56"

**Primary Drainage Basin and Code:** Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Lead, Silver, Zinc

Activity Status: Active ,Inactive/Exploration X ,Abandoned .

Ownership status: Known YX N ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Peter Antonoli,

Emerald Resources, 1405 Steele, Butte, MT 59701. (406) 723-8730;

Harry Anderson, 1900 E. Girard Place #307, Englewood, CO 80010.

(303) 789-9556.

Relationship to other mines/sites in the area/district: This site is located north of the Belt Patent (23-035) and east of the Wright Lode (23-045) and Edwards (23-046).

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? In July of 1974, a bypass pipeline was installed parallel with Galena Creek, which extends the entire length of the Block P Mine dump. The pipe diverted flow from Galena Creek around the toe of the dump during low flows. It was a failed past reclamation activity, yet the top of the mine dump is void of any vegetation. The Hughesville district is currently listed under the CECRA Program.

General site features: Elevation 5900'-6000', Slope 5°-10°,  
Aspect On north slope of Barker Canyon

Land use: Mining\_\_\_, Recreational X, Residential X, Urban\_\_\_,  
Agricultural X, Other(Specify) Timber harvesting\_\_\_

Area of disturbed/unvegetated lands? 10 acres.  
Dimensions:

**Predominant vegetation types:** Douglas fir, spruce, shrubs, grasses

Access: roads - good X ,poor \_\_,4wd \_\_,trail \_\_.  
Other logistical considerations (proximity to other sites).  
Accessed via USFS Road No. 120, which joins with Hwy. 89 near  
Monarch.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Minerals are galena, sphalerite, pyrite,  
chalcopryrite, and tetrahedrite. Underground workings are connected  
to the Wright Lode and Edwards Mine located 1/2 mile to the  
southeast of the Block P Mine.

Mining/milling history, ore type/tenor, host rock, gangue: The  
site was initially developed in 1875 and operated intermittently  
into the 1950's. A 400-ton floatation plant was constructed two  
miles south of the Block P Mine near the mouth of Galena Creek in  
1927. Ore minerals occur in veins localized along tension  
fractures in a porphyritic syenite plug. A calcite, barite,  
marcasite, quartz and rhodochrosite gangue.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment (Barker shaft) open

Adits - Yes X, No     , # 1, Comment Open

Pits - Yes     , No X, #     , Comment     

Placers - Yes     , No X, #     , Comment     

Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

05/12/1993

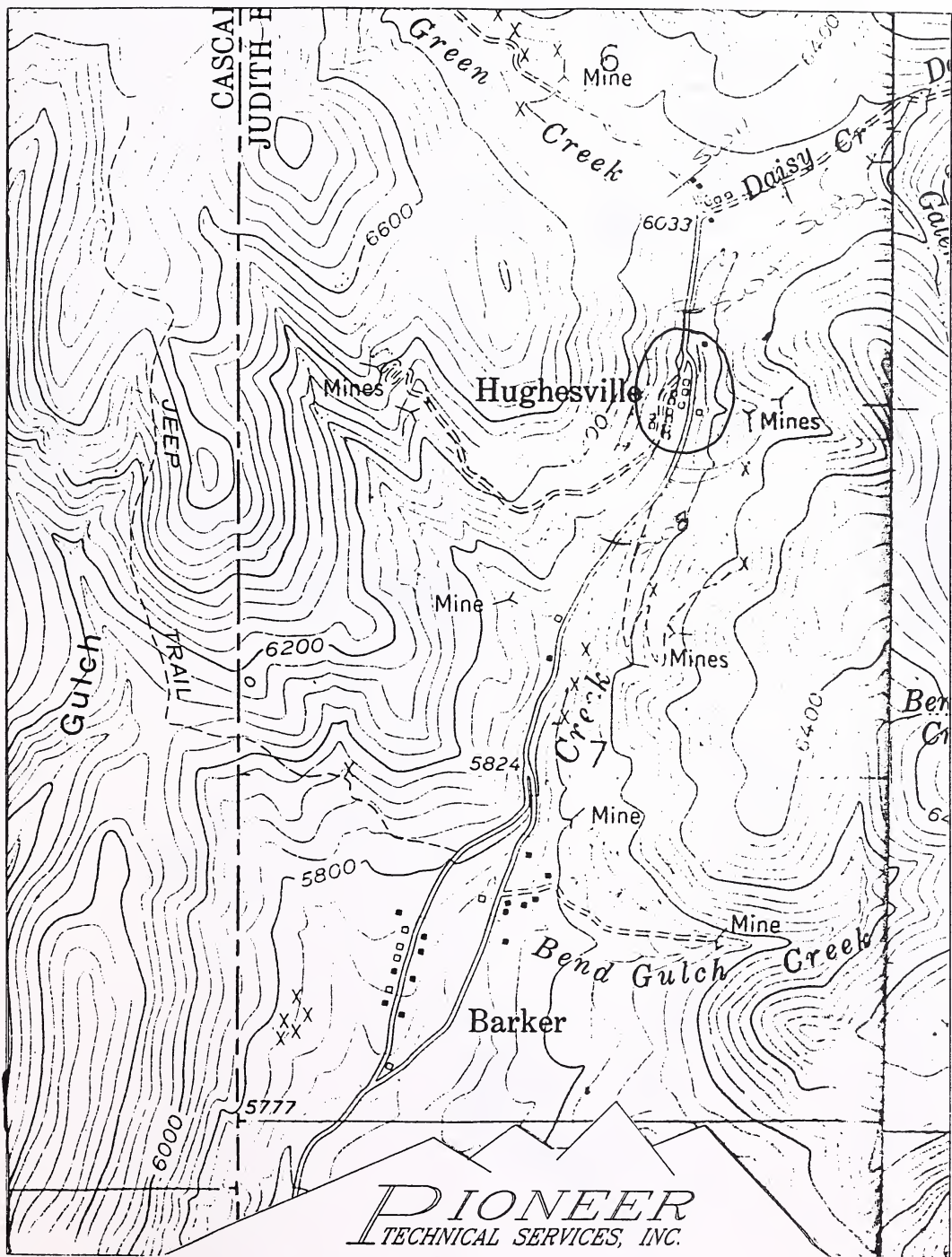
Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB ←  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:







BLOCK P MINE, P.A. NO. 23-001

T15N, R09E, SECTION 07

SCALE: 1" = 1000'





SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAIL		WIRE FENCE
	DUMP		BUILDING
	SOIL SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE (GROUND) AND SURFACE DRAINAGE		EDGE OF ASPHALT
	WATER WELL		EDGE OF GRAVEL
	TAILINGS		SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
GALENA CREEK SAMPLE LOCATIONS  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA  
SPokane WASHINGTON

DRAWN BY: JMC DATE: 10/83  
DESIGNED BY: JMC JOB NO.: 93-17  
APPROVED BY: JMC F.B. NO.:  
PIONEER ENGINEERING CONSULTANTS

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





## SAMPLERS:

[illegible]

D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** Typical forest soils have a thin organic horizon; 4-6" horizon with pH's ranging from 4.5 to 6.5 standard units. Refer to attached historical analytical data.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 1 Identification: Adit at the north end of the Block P dump

Filled shafts: Yes X, No     , Number: 1 Identification: Barker shaft at the north end of the dump

Seeps/Springs: Yes X, No     , Number: 2 Identification: One at Galena Creek streambed near the southern end of dump; one at an adit

Groundwater wells within 5 miles?: Yes X, No     ;

Number of well logs: 21

Distance to nearest well used for drinking? < 0.5 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Shaft and adit discharges are contaminated. Waste rock is in direct contact with both adit discharge and surface water.

Other observations/notes: N/A

**SAMPLERS:**

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Headwaters of Galena Creek are Green Creek and Daisy Creek. Site lies adjacent to Galena Creek.

Dry streambeds: Yes     , No X, Name(s):                     

Other surface water: Yes     , No X, Name(s)/Description:                     

Waste materials within any floodplain: Yes X, No      Source ID(s): Block P waste dump is within Galena Creek.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 6 during Galena Creek investigation (07-090)

High Flow: 30 cfs, Average Flow: 6 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     , Describe: Galena Creek is flowing adjacent to and through Block P waste dump. Several seeps are flowing from the dump also.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Possible irrigation for residential use and Dry Fork Belt Creek has fishery, wetlands, stock watering, and irrigation. Above confluence with Galena Creek, Dry Fork Belt Creek is reported to contain cutthroat trout (sensitive species).

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? 1000+ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Turbidity from Galena Creek can be seen in Dry Fork Belt Creek below the confluence for at least 1,000 feet. Galena Creek is discolored (iron-stained) of its length and particularly turbid near and below Block P Mine.



# **SURFACE WATER INVENTORY FORM**

SAMPLERS: Bullock, Babits, Flammang, Lasher, Clark, Pierson

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as CaCO <sub>3</sub>	Flow cfs/gpm	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
SW-8	SW	Upstream of Belt Patent Mine, downstream of Block P Mine	6.91	10	131.6	5.7	3	4.075 cfs (M)	07-090-SW-8	06/07/93 1145	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-8	SE	Upstream of Belt Patent Mine, downstream of Block P Mine	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-8	06/07/93 1145	T-Metals
SW-9	SW	Galena Creek above Block P Mine, approx. 20 feet above old weir	7.2	364	480	4.8	27	3.405 cfs (M)	07-090-SW-9	06/07/93 1130	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-9	SE	Galena Creek above Block P Mine, approx. 20 feet above old weir	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-9	06/07/93 1145	T-Metals
SW-10	SW	Green Creek before confluence with Galena Creek approx. 610 feet	6.81	220	87.4	5.7	61	0.58 cfs (M)	07-090-SW-10	06/07/93 1145	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-10	SE	Green Creek before confluence with Galena Creek approx. 610 feet	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-10	06/07/93 1145	T-Metals
SW-11	SW	Daisy Creek before confluence with Green Creek	7.16	480	522	4.5	25	2.39 cfs (M)	07-090-SW-11	06/07/93 1145	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-11	SE	Daisy Creek before confluence with Green Creek	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-11	06/07/93 1130	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

## t

**SAMPLERS:**

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30 X; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments Increases during summer months

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: \_\_\_\_\_  
Tire tracks, tourists

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 2, types and locations: \_\_\_\_\_  
One open shaft and adit at the northern end of the Block P dump

Hazardous structures: Yes X, No\_\_\_\_, Number >5, types and locations: \_\_\_\_\_  
Several buildings on the Block P dump

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 1, types and locations: \_\_\_\_\_  
Slopes to Block P dump are very steep and high.

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 1, types and locations: \_\_\_\_\_  
Block P dump is extremely steep and high and undercut by Galena Creek.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

- Economic Geology, Geological Observations of the Block P Mine, Hughesville, Montana, Volume 33, Written by Kiril Spiroff, 1938, pp. 554-567.
- MBMG, Mines and Mineral Deposits for Judith Basin County, Barker District, Montana, Author Unknown, 1927.
- MBMG, Well Log Database, September 8, 1993.
- MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.
- MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.
- MDHES/WQB, Analytical Data for Block P Mine, December 7, 1979.
- MDSL/AMRB, Hughesville/Barker Mining District Galena Creek Drainage Preliminary Assessment Project Report, Prepared by Chen-Northern, Inc., March 1991.
- MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Block P, Prepared by Daphne Digrindakis, June 12, 1985.
- MDSL/AMRB Files, Department of the Interior, Bureau of Mines, Mineral Industry Survey for the Block P Mine, 1946 and 1947.
- MDSL/AMRB Files, Department of the Interior, Office of Surface Mining, Abandoned Mine Lands Inventory Update Form for Block P Mine and Hughesville Mining District, Prepared by L.C. Hanson Company, December 10, 1985.
- MDSL/AMRB Files, Environmental Assessment Analytical Data for Block P Mine, Prepared by MSE, Inc., October 4 and 29, 1990.
- USBM, Mineral Industry Survey, Information Circular 7602, Author Unknown, 1946.
- USEPA, First Annual Report on the Hughesville Acid Mine Demonstration project, EPA Grant S-803822, Prepared by Montana Department of National Resources and Conservation, July 1, 1975 to June 1, 1976.
- USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.
- Witkinn, J.J., Geologic Map of the Barker Quad, Judith Basin and Cascade Counties, Montana, Map GQ-898, 1971.
- MDSL AMRB/PIONEER 4/9/93



LABORATORY ANALYTICAL DATA

BLOCK P MINE  
PA NO. 23-001



Block P. Mine PA# 23-001  
AMREB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
07-090-SE-8	255	218	3 J	9 J	4.8	215 J	43700	0.161 J	2120 J	19 J	3390	5 U	749 J	NR
07-090-SE-9	43	222	2.6 J	9.4 J	3.6	243 J	21400	0.057 J	2600 J	24 J	432	5 U	632 J	NR
07-090-SE-10	28	88.8	0.6 U	4.4 J	1.8	140 J	13400	0.03 J	653 J	9 J	82	4 U	180 J	NR
07-090-SE-11	101	608	33.3 J	13.8 J	8.5	1450 J	50200	0.178 J	10100 J	78 J	6800	15	7000 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. Zn (mg CaCO3/L)
07-090-SW-8	29	23.6	30.2	5.99 U	5 U	239	11800	0.038 U	7560	41.5	51.1	38.9	7090	137
07-090-SW-9	0.98 U	25.1	2.55 U	5.99 U	5.6	150	1370	0.038 U	558	8.78 U	37.6	32.1	585	107
07-090-SW-10	2.09	20	2.55 U	5.99 U	5.13	6.77	403	0.038 U	77.4	8.78 U	2.52	33	54.3	85.5
07-090-SW-11	0.98 U	26.5	3.9	5.99 U	5 U	234	1950	0.038 U	840	8.78 U	64	32.9	861	115

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
07-090-SW-8	274	< 5.0	178	< 0.06	NR
07-090-SW-9	182	< 5.0	86	< 0.07	NR
07-090-SW-10	130	< 5.0	35	< 0.05	NR
07-090-SW-11	218	< 5.0	113	< 0.05	NR

LEGEND

SE8 - Upstream of Belt Patent Mine, downstream of Block P. Mine  
SE9 - Galena Creek above Block P. Mine, approx. 20' above old weir.  
SE10 - Green Creek before confluence with Galena Creek approx. 610'  
SE11 - Daisy Creek before confluence with Green Creek.  
SW8 - Same as sample SE8  
SW9 - Same as sample SE9  
SE10 - Same as sample SE10  
SE11 - Same as sample SE11.





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

BLOCK P MINE  
PA NO. 23-001



# **AIMSS SCORESHEET**

SITE NAME:

BLOCK P MINE

PA NUMBER:

23-001

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	300
2		EXCEEDENCES	100
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6			1044.000
7	GW - TARGETS	WELLS - 1 MI. x 2.5	2.5
8		WELLS - 1 TO 4 MI	20
9		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8
10			22.5
		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>
			<b>18792000</b>

		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16			1145.796
17		DRINKING WATER POP'N	0
18		IMPACTED DRAINAGE	0
19	SW - TARGETS	WETLANDS	10
20		FISHERY	0
21		RECREATION	5
22		IRRIGATION/STOCK	0
23		T & E SPECIES HABITAT	0
24		TARGETS SCORE	SUM LINES 16 THRU 22
			15
		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>
			<b>13749552</b>

		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	15
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29			11.458
30		POPULATION - 4 MILES	30
31	AIR - TARGETS	NEAREST RESIDENCE	0
32		WETLANDS	0
33		PARKS / WILDERNESS	0
34		T & E SPECIES HABITAT	0
35		TARGETS SCORE	SUM LINES 29 THRU 33
			30
		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>
			<b>25781</b>

		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	20
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40			10.440
41	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	30
42		NEAREST RESIDENCE	0
43		RECREATIONAL USE	2
44		TARGETS SCORE	SUM LINES 40 THRU 42
			32
		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>
			<b>50112</b>

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE  
(LINES 10 + 24 + 35 + 44) / 100,000

326.17

LINE NO.				SITE NAME:	BLOCK P MINE
				PA NUMBER:	23-001
	<b><u>SITE SAFETY</u></b>				
1	THREAT	ACCESSIBILITY			20
2		OPEN SHAFTS	100 EA.		100
3		OPEN ADITS	50 EA.		50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.		75
5		HAZ. STRUCTURES	40 EA.		160
6		EXPLOSIVES			0
7		HAZ. MATERIALS			0
8		HAZARDS SCORE	SUM LINES 2 THRU 7		385
9		POPULATION - 1 MILE			30
10	TARGETS	NEAREST RESIDENCE			0
11		RECREATIONAL USE			2
12		TARGETS SCORE	SUM LINES 9 THRU 11		32
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>		<b>246.40</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

SITE NAME:		BELT PATENT			
DATE:		16-Aug-90			
STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
GALENA CK (UPGRADIENT)	75-100	5.50	429	14.1	DANGERAD BLOCK P SAMPLE SERVES AS UPGRAD BELT
GALENA CK (DOWNGRADIENT)	75-100	5.53	436	14.1	UPGRAD MARCELLINE SAMPLE SERVES AS DANGERAD CK

SITE NAME:		BLOCK P MINE			
DATE:		17-Aug-90			
STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SEEP (TRAIL BUILDING)	1-2	3.45	1010	11.7	SOURCE MAY BE ACID BITING THE BUILDING
STREAM (WEST DRAINAGE)	11	4.12	79	10.1	
QUICK ACID	6	6.49	375	7.9	
GALENA CK (UPGRADIENT) (CALCULATED)	104?	7.62	229	11.3	SAMPLE COLLECTED
GALENA CK (DOWNGRADIENT)	107	5.79	365	10.8	SAMPLE COLLECTED, LOCATED AT INCHESVILLE RD C BELOW THE BLOCK P DUMP

SITE NAME:		WRIGHT & EDWARDS MINES			
DATE:		17-Aug-90			
STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SEEP (BLW ED'S DUMP)	1-2	2.50	1780	12.2	SEEP & TOE OF EDWARD'S ADIT QUIN' IN DRAINAGE
ACID STREAM	4	2.71	1090	11.0	
FRESH STREAM	9	6.00	147	12.1	ALKALINITY = 77 mg/l as CaCO3
COMBINED STREAM	13	6.58	152	12.5	
COMBINED STREAM (OLD DUMP)	14	6.00	173	14.2	ADIT & DUMP APPROX 200 YD ABOVE INCHESVILLE R STREAM FLOWS INTO GALENA CK AT THE MARCELLINE

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Block P Dump Upstream Galena Creek

LAB NO: W8572

DATE RECEIVED: 09-14-90

Hardness 83 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As <0.001 mg/L

Cd 0.0004 mg/L

Cu 0.01 mg/L

Fe 0.30 mg/L

Pb 0.004 mg/L

Zn 0.27 mg/L



REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Block P Dump Downstream Galena Creek

LAB NO: W8571

DATE RECEIVED: 09-14-90

Hardness 197 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.022 mg/L

Cd 0.0291 mg/L

Cu 0.17 mg/L

Fe 18.8 mg/L

Pb 0.036 mg/L

Zn 10.0 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Block P Dump--08/17/90

LAB NO: S2714

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.52 SU

Total Metals

As 588 mg/Kg

Cd <1 mg/Kg

Cu 136 mg/Kg

Fe 31.500 mg/Kg

Pb 7920 mg/Kg

Zn 1080 mg/Kg

STATE HEALTH DEPT.

WATER QUALITY BUREAU

HELENA, MONTANA 596

STATE	MONTANA	COUNTY	JUDITH BASIN
LAT.-LONG.	47 5 4N 1103738W	SAMPLE LOCATION	15N 9E 6DC
STATION CODE		ANALYSIS NUMBER	79W3087
DATE SAMPLED	12-07-79	DRAINAGE BASIN	410
TIME SAMPLED		WATER FLOW RATE	75. GPM
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	FLOAT + TIME
SAMPLE SOURCE	STREAM	ALTITUDE OF LAND SURFACE	5960. FT
WATER USE	MULTIPLE	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: BLOCK P MINE DRY FRK BELT CREEK

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE (PO4 AS P)		
			NO3+NO2 (TOT AS N)		

SUM CATIONS

0.0

0.0

SUM ANIONS

0.0

0.00

LABORATORY PH  
FIELD WATER TEMPERATURE (C)  
SUM-DISS. IONS MEAS.(MG/L)  
LAB CONDUCTIVITY-UMHOS-25C

TOT HARDNESS(MG/L-CAC03)  
TOT ALKALINITY(MG/L-CAC03)  
LABORATORY TURBIDITY (NTU)  
SODIUM ADSORPTION RATIO

A D D I T I O N A L		P A R A M E T E R S	
ARSENIC,TR (MG/L AS AS)	< .001	CADMIUM, TR (MG/L AS CD)	< .005
COPPER,TR (MG/L AS CU)	.01	LEAD,TR (MG/L AS PB)	< .05
ZINC,TR (MG/L AS ZN)	.45	IRON,TR (MG/L AS FE)	.59
MANGANESE,TR(MG/L AS MN)	.55	PH,FIELD(SU)	6.5
NICKEL,TR (MG/L AS NI)	< 0.10		

REMARKS: AML

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVLENTS PER LITER  
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED  
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO AML56	SAMPLER BAM	HANDLING 11	ANALYST DB	LAB
COMPLETED 01-07-80	COMPUTER RUN	01/28/80	DATA 0975/PROG	0876 FUND 6150
STND DEV. ION BALANCE	0.00	CA	MG	NA
SEGMENT	MPDES	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
33.3	33.3	0.0	33.3	0.0
79W30				

CALC. MEQ/L= INSUFFICIENT DATA

79W30

TABLE 5-9

**AVERAGE CONCENTRATIONS OF TOTAL AND EXTRACTABLE METALS  
IN MILL TAILINGS  
GALENA CREEK PRELIMINARY ASSESSMENT**

Parameter	Type <sup>1</sup>	Mean	Standard Deviation	Minimum	Maximum
Aluminum	Total	3,504.0	2,254.0	1,260.0	6,470.0
	Extract	860.0	689.0	206.0	1,870.0
Arsenic	Total	1,015.0	615.0	500.0	2,140.0
	Extract	217.0	223.0	13.0	500.0
Cadmium	Total	24.5	20.0	9.7	63.0
	Extract	5.3	3.5	1.7	9.9
Chromium	Total	3.5	3.6	1.0	10.0
	Extract	1.3	1.3	0.1	4.1
Copper	Total	293.0	197.9	79.0	638.0
	Extract	133.0	133.5	17.9	305.0
Iron	Total	73,400.0	37,610.0	27,300.0	141,000.0
	Extract	24,270.0	19,180.0	4,940.0	48,200.0
Lead	Total	5,227.0	3,590.0	2,070.0	10,600.0
	Extract	3.3	2.5	0.5	8.0
Manganese	Total	735.0	1,273.0	6.0	3,290.0
	Extract	2,584.0	3,823.0	1.9	8,700.0
Mercury	Total	0.54	0.30	0.20	1.0
	Extract	0.21	0.51	0.001	1.25
Nickel	Total	19.3	9.2	12.0	38.0
	Extract	3.3	1.9	1.3	5.7
Silver	Total	78.0	36.0	19.0	113.0
	Extract	0.5	0.4	0.14	1.25
Zinc	Total	674.0	300.0	76.0	950.0
	Extract	457.0	428.0	102.0	1,050.0

<sup>1</sup> Statistics on total metals based on analysis of 7 samples and reported in mg/kg; extract metals were measured in saturated paste extracts (reported in mg/L) and are based on 6 samples.

TABLE 5-12

**AVERAGE CONCENTRATIONS OF TOTAL AND EXTRACTABLE METALS  
IN STREAMSIDE TAILINGS  
GALENA CREEK PRELIMINARY ASSESSMENT**

Parameter	Type <sup>1</sup>	Mean	Standard Deviation	Minimum	Maximum
Aluminum	Total	3,964.0	2,678.0	1,610.0	9,110.0
	Extract	4.0	5.5	0.5	15.0
Arsenic	Total	1,011.0	750.0	16.0	2,040.0
	Extract	0.05	0.03	0.002	0.09
Cadmium	Total	19.0	10.7	9.0	44.0
	Extract	0.70	0.56	0.06	1.5
Chromium	Total	9.2	11.1	1.0	34.0
	Extract	0.04	0.04	0.01	0.12
Copper	Total	295.0	142.0	130.0	563.0
	Extract	1.2	1.3	0.3	3.6
Iron	Total	36,310.0	19,390.0	12,300.0	65,400.0
	Extract	22.5	46.0	0.2	116.0
Lead	Total	10,460.0	7,391.0	408.0	18,600.0
	Extract	1.7	2.2	0.1	5.7
Manganese	Total	209.0	427.0	26.0	1,340.0
	Extract	11.2	22.9	0.3	57.8
Mercury	Total	0.71	0.66	0.05	2.1
	Extract	0.01	0.02	0.001	0.045
Nickel	Total	16.3	6.8	10.0	28.0
	Extract	0.06	0.08	0.01	0.19
Silver	Total	142.0	137.0	2.0	440.0
	Extract	0.01	0.08	0.01	0.03
Zinc	Total	1,578.0	1,437.0	553.0	4,830.0
	Extract	142.0	151.0	8.7	401.0

<sup>1</sup> Statistics on total metals based on analysis of 9 samples and reported in mg/kg; extract metals were measured in saturated paste extracts (reported in mg/L) and are based on 6 samples.

## APPENDIX C-1

XRF DATA BASE, REGRESSION ANALYSES,  
AND PREDICTIVE CURVES FOR XRF DATA



GALENA CREEK PRELIMINARY ASSESSMENT  
XRF CALIBRATION STANDARD MEASUREMENTS

Page 2 of 2

SAMPLE	DATE	AS LAB VALUE	CU LAB VALUE	FE LAB VALUE	MN LAB VALUE	NI LAB VALUE	PB LAB VALUE	ZN LAB VALUE
S1150001		720	46	30700	38	5	11700	314
S1151236		324	76	27500	44	6	4050	130
S1770001		299	88	29100	16	3	10200	453
S1171836		312	93	29300	34	7	23600	340
S1173648		478	111	39600	31	10	24600	975
S1211836		457	32	41100	26	4	4210	313
S1221836		1030	37	59900	29	8	9360	184
S1121561		1580	314	81000	3290	13	10000	860
S1240001		388	55	25400	36	5	40700	2150
S1240112		311	31	16600	93	6	3270	262
S1241240		380	11	15700	80	8	291	78
S1300001		510	332	33300	29	8	34000	792
S1301230		840	172	40100	38	10	9170	626
S1330001		2010	568	65400	63	17	18600	4830
S1330324		1600	206	25200	40	10	18000	558
S1341022		897	36	37000	1410	16	1030	249
S1350001		220	40	17400	13	13	22000	388
S1351536		116	129	15400	31	8	12200	1000
S1361536		164	160	18500	29	10	22800	2000
S1076672		500	79	27300	10	12	2810	562
S1094866		698	157	91500	67	22	2070	905
S1096613		2140	688	141000	115	38	4460	76
S1120001		920	312	50400	1630	14	10600	731
S1122162		640	190	33900	1440	21	680	321
S1000001		920	220	23200	28	13	13500	3010
S1000118		2040	130	60000	180	23	6340	630
S1001836		9	187	23500	123	37	91	478
S1020001		610	138	22900	38	10	6130	553
S1020848		160	268	57300	1340	24	451	1220
S1024860		16	369	12300	94	22	408	858
S1050001		690	349	26100	26	11	12200	1450
S1050106		1050	410	34400	76	12	18500	1090
S1050612		1910	980	73600	10900	27	1540	1070
S1070001		520	254	43400	18	16	4000	588
S1070166		730	179	78400	6	22	2310	950
S1370001		270	2140	134000	15600	42	8690	1580
S1370124		490	483	121000	5108	30	1340	613
S1372448		670	845	148000	2040	22	4100	503
HMW51011		560	106	37800	216	9	11500	2800



GALENA CREEK PRELIMINARY ASSESSMENT  
XRF CALIBRATION STANDARD MEASUREMENTS

Page 1 of 2

SAMPLE	DATE	AS	CU	FE	MN	NI	PB	ZN
		XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX
S1150001	121990	1.00	0.37	2.00	1.82	0.49	1.88	0.33
S1151236	121990	0.96	0.38	2.49	2.28	0.51	1.77	0.34
S1770001	121990	1.45	0.43	2.24	2.04	0.53	2.74	0.43
S1171836	121990	1.93	0.52	2.55	2.38	0.60	3.72	0.53
S1173648	121990	1.82	0.53	2.73	2.61	0.62	3.40	0.53
S1211836	121990	0.76	0.37	2.63	2.43	0.51	1.39	0.32
S1221836	121990	1.02	0.37	2.81	2.63	0.54	1.87	0.34
S1121561	121990	1.52	0.54	3.79	3.61	0.72	2.76	0.51
S1240001	121990	2.14	0.58	2.18	2.08	0.60	4.17	0.65
S1240112	121990	0.94	0.38	1.78	1.65	0.45	1.81	0.36
S1241240	121990	0.51	0.27	1.40	1.33	0.34	0.94	0.24
S1300001	121990	2.30	0.61	2.60	2.50	0.67	4.78	0.60
S1301230	121990	1.50	0.50	3.09	2.98	0.63	2.74	0.45
S1330001	121990	2.43	0.99	5.23	5.10	1.09	4.45	1.03
S1330324	121990	2.66	0.59	2.14	2.09	0.61	5.00	0.66
S1341022	121990	0.67	0.35	2.87	2.81	0.50	1.17	0.28
S1350001	121990	1.64	0.43	1.48	1.47	0.43	3.23	0.44
S1351536	121990	1.47	0.48	1.44	1.41	0.46	2.86	0.51
S1361536	121990	1.90	0.54	1.59	1.40	0.50	3.76	0.60
S1076672	121990	0.75	0.34	1.74	1.50	0.43	1.36	0.30
S1094866	121990	0.79	0.47	3.77	3.05	0.73	1.45	0.40
S1096613	121990	1.37	1.07	5.44	4.59	1.18	2.28	1.13
S1120001	121990	1.76	0.52	2.83	2.48	0.64	3.34	0.52
S1122162	121990	0.58	0.32	2.09	1.79	0.43	1.04	0.27
S1000001	121990	1.88	0.65	2.10	1.88	0.62	3.55	0.74
S1000118	121990	1.44	0.49	4.20	3.68	0.77	2.50	0.42
S1001836	121990	0.41	0.36	2.30	1.98	0.48	0.76	0.30
S1020001	121990	1.10	0.38	1.71	1.50	0.43	2.06	0.39
S1020848	121990	0.54	0.50	2.98	2.65	0.63	0.99	0.45
S1024860	121990	0.43	0.36	1.12	0.98	0.37	0.81	0.36
S1050001	121990	1.80	0.56	2.18	1.97	0.58	3.32	0.58
S1050106	121990	2.37	0.60	2.61	2.30	0.68	4.37	0.64
S1050612	121990	1.00	0.62	6.82	5.94	1.07	1.62	0.47
S1070001	121990	0.97	0.40	2.30	2.03	0.53	1.81	0.37
S1070166	121990	0.94	0.48	3.48	3.01	0.67	1.65	0.44
S1370001	121990	0.87	0.66	7.44	7.00	1.16	1.63	0.52
S1370124	121990	0.71	0.58	7.70	6.81	1.15	1.26	0.40
S1372448	121990	0.94	0.63	9.43	8.35	1.38	1.71	0.40
HMW51011	121990	1.25	0.50	2.38	2.12	0.57	2.38	0.53

GALENA CREEK PRELIMINARY ASSESSMENT  
SOIL/MINE WASTE XRF INDEX AND PREDICTED METAL CONCENTRATIONS

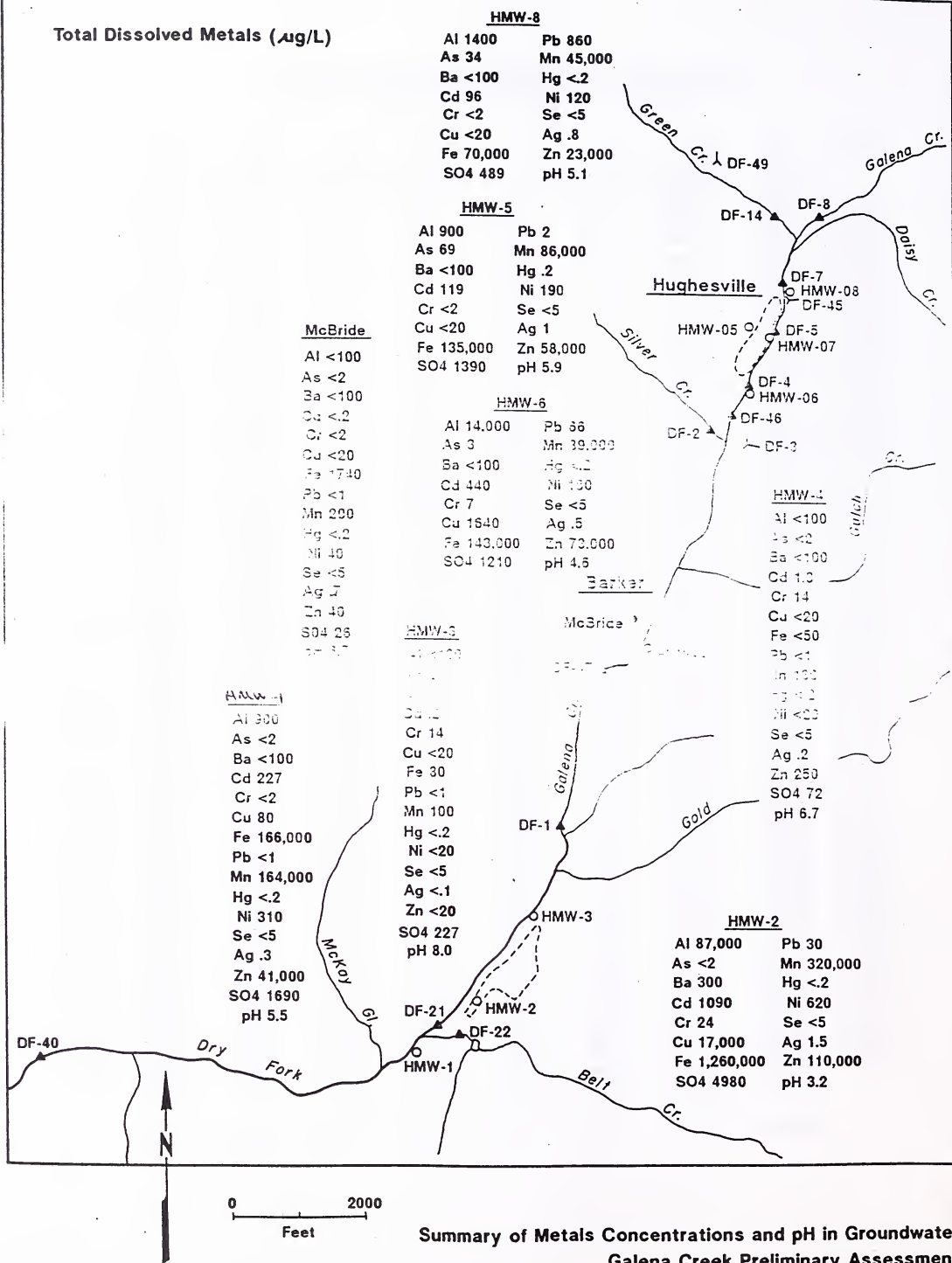
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SAMPLE	DATE	AS	CU	FE	MN	NI	PB	ZN
		XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX	XRF INDEX
HMW52224	121990	0.96	0.41	2.13	1.66	0.54	1.81	0.38
S1010001	121990	4.36	1.93	5.76	5.09	1.64	8.20	2.33
S1010120	121990	1.21	0.44	1.84	1.63	0.50	2.32	0.44
S1030001	121990	1.06	0.40	2.42	2.06	0.55	1.95	0.38
S1030138	121990	2.25	0.84	2.73	2.41	0.77	4.23	0.98
S1033847	121990	2.69	2.61	4.78	4.28	1.69	4.60	3.34
S1040001	121990	1.68	0.66	2.83	2.42	0.71	3.11	0.70
S1040115	122090	2.38	1.07	2.79	2.51	0.87	4.41	1.26
S1041548	122090	1.10	0.43	3.05	2.79	0.63	1.89	0.38
S1060004	122090	3.06	0.76	2.12	2.01	0.72	5.89	0.89
S1060412	122090	0.64	0.31	1.49	1.36	0.37	1.21	0.23
S1080001	122090	0.57	0.30	1.54	1.41	0.38	1.05	0.27
S1083648	122090	0.73	0.49	2.76	2.48	0.59	1.34	0.44
S1087892	122090	1.64	0.68	3.37	3.15	0.78	2.86	0.63
S1110001	122090	1.59	0.61	5.46	5.11	0.92	2.82	0.53
S1116084	122090	0.93	0.53	4.74	4.45	0.82	1.62	0.42
S1111081	122090	1.30	0.90	5.46	5.16	1.06	2.04	0.89
S1131236	122090	1.90	0.50	2.32	2.11	0.56	3.67	0.55
S1141230	122090	0.67	0.32	1.80	1.61	0.41	1.29	0.29
S1181236	122090	1.17	0.43	2.75	2.59	0.55	2.18	0.40
S1161230	122090	1.25	0.46	2.01	2.01	0.51	2.40	0.46
S1192846	122090	1.54	0.44	1.81	1.73	0.48	3.00	0.43
S1201836	122090	1.27	0.50	2.06	2.02	0.53	2.45	0.51
S1231830	122090	0.60	0.37	3.78	3.66	0.60	1.10	0.28
S1250114	122090	1.23	0.49	1.92	1.76	0.47	2.28	0.51
S1251436	122090	2.11	0.55	2.19	2.15	0.59	3.97	0.61
S1260001	122090	1.18	0.44	1.89	1.95	0.47	2.23	0.43
S1261236	122090	1.17	0.48	2.41	2.47	0.52	2.24	0.47
S1271236	122090	1.34	0.42	1.47	1.49	0.41	2.57	0.46
S1281236	122090	5.13	1.02	4.13	4.43	1.05	9.63	1.11
S1290001	122090	1.28	0.45	1.88	1.87	0.50	2.45	0.47
S1291230	122090	1.97	0.50	2.13	2.24	0.55	3.79	0.54
S1311236	122090	1.17	0.40	1.58	1.61	0.43	2.18	0.39
S1320001	122090	1.14	0.83	3.74	3.97	0.76	2.09	0.82
S1321230	122090	0.94	0.45	1.73	1.77	0.44	1.83	0.45
S1340001	122090	1.71	0.71	3.34	3.53	0.71	3.22	0.75
S1340108	122090	1.53	0.47	3.04	3.14	0.57	2.81	0.48
S1380001	122090	0.55	0.44	2.77	2.85	0.58	1.00	0.34
S1380112	122090	0.43	0.29	1.35	1.40	0.33	0.81	0.26
S1383648	122090	0.41	0.27	0.77	0.81	0.28	0.78	0.25
S1090001	121990	0.75	0.40	3.39	2.85	0.67	1.37	0.34
S1090148	121990	0.69	0.33	1.95	1.65	0.44	1.24	0.30
S1100001	121990	1.31	0.39	2.07	1.74	0.49	2.47	0.37
S1103654	121990	0.79	0.42	3.62	3.07	0.66	1.45	0.35
S1108490	121990	1.36	0.79	5.20	4.98	0.98	2.38	0.82

GALENA CREEK PRELIMINARY ASSESSMENT  
SOIL/MINE WASTE XRF INDEX AND PREDICTED METAL CONCENTRATIONS  
Page 2 of 3

SAMPLE	DATE	AS PREDICTED	CU PREDICTED	FE PREDICTED	MN PREDICTED	NI PREDICTED	PB PREDICTED	ZN PREDICTED
HMW52224	121990	396	125	30587	-1199	14	6441	588
S1010001	121990	2436	1147	77063	-2833	39	43971	12254
S1010120	121990	345	123	24590	-821	10	10308	827
S1030001	121990	696	105	35129	27	10	6222	481
S1030138	121990	1192	364	35217	-1431	19	20558	3970
S1033847	121990	3744	1464	68712	-6157	75	12813	22032
S1040001	121990	1094	293	39398	-678	18	12922	2340
S1040115	122090	1592	534	35818	-2292	27	20219	6037
S1041548	122090	1397	164	45811	1524	7	2936	408
S1060004	122090	989	298	21288	-2177	3	33296	2437
S1060412	122090	197	29	21214	-173	11	2947	184
S1080001	122090	297	19	22409	-124	8	1390	172
S1083648	122090	447	222	42187	960	19	2861	1284
S1087892	122090	1946	404	48998	939	16	7659	1793
S1110001	122090	1646	368	84081	5856	15	8595	988
S1116084	122090	1047	322	74711	4833	13	2425	826
S1111081	122090	2648	575	85826	4348	21	-1086	4110
S1131236	122090	492	129	29605	75	9	19391	973
S1141230	122090	97	38	26225	189	11	3930	218
S1181236	122090	646	144	40139	1810	12	8078	528
S1161230	122090	345	142	27257	337	6	10882	941
S1192846	122090	243	133	22566	-245	10	15599	415
S1201836	122090	295	170	27982	132	9	11445	1313
S1231830	122090	347	147	59802	4810	11	1546	133
S1250114	122090	746	150	26019	-25	19	8388	1378
S1251436	122090	1093	167	26757	-150	2	19098	1226
S1250001	122090	495	133	25629	615	8	9049	789
S1261235	122090	345	171	34313	1765	11	9733	1100
S1271236	122090	395	63	17836	-214	7	11899	889
S1281236	122090	2984	588	46572	2012	-5	51998	1937
S1290001	122090	395	112	24969	-14	3	11037	995
S1291230	122090	592	140	26156	632	-1	19845	825
S1311236	122090	646	95	20550	-50	7	8078	496
S1320001	122090	796	508	56916	3937	26	6820	3835
S1321230	122090	96	132	23845	368	12	7808	1208
S1340001	122090	844	342	47690	3056	11	14732	2709
S1340108	122090	1095	141	43585	3420	5	10767	790
S1380001	122090	348	225	43115	2325	6	827	673
S1380112	122090	98	9	19765	441	8	483	256
S1383648	122090	48	-20	10121	-945	6	471	217
S1090001	121990	497	146	52668	1247	10	2873	431
S1090148	121990	547	48	28849	-35	13	1735	265
S1100001	121990	595	95	28105	-331	13	10365	168
S1103654	121990	497	175	56340	2107	18	3447	474
S1108490	121990	1546	429	80712	4700	11	5843	3521
AVERAGE		873	251	39269	724	13	10681	1987

# Total Dissolved Metals ( $\mu\text{g/L}$ )



MEMPHISVILLE GROUNDWATER QUALITY DATA  
Physical Properties

Station	Sample Type	Sample Date	Sample Time	Lab Number	Sampling Method	Water Temperature (C)	Field pH (S.H.)	Lab pH (S.U.)	Field SC (umhos/cm)	Lab SC (umhos/cm)	TDS (mg/l)	Sodium Adsorption Ratio
AAAX-2	LD	11/30/90		109249	HHP			2.9		6130	8560	
AAAX-2	N	11/14/90	1650	109249	HHP	6.0	2.5	2.9	6200	6010	8460	0.28
HW-01	N	11/15/90	0900	109248	HHP	5.0	5.5	5.5	2285	2340	2410	0.13
HW-01	N	11/14/90	1615	109237	HHP	6.0	2.8	3.2	5480	5600	7930	R
HW-02	N	11/15/90	0950	109247	BAIL	4.0	7.5	8.0	1330	1250	822	6.09
HW-03	N	11/15/90	1100	109246	HHP	6.0	6.4	6.7	232	243	152	0.13
HW-04	N	11/15/90	0940	109242	BAIL	7.0	5.7	5.9	2004	2110	1860	R
HW-05	N	11/14/90	1300	109238	HHP	6.5	4.8	4.6	1782	2050	1540	R
HW-06	N	11/14/90	1115	109256	HHP			0.0		845		5.41
HW-08	BFS	11/14/90	1055	109240	HHP	7.0	5.1	5.1	918	1030	860	R
HW-08	D	11/29/90		109240	HHP			5.1		1030	860	R
HW-08	LD	11/14/90	1045	109241	HHP	7.0	5.1	5.1	918	1110	780	R
HW-08	XCB	11/14/90	1105	109239	HHP	8.0	4.9	5.0	9	33	1	U
MCBRIDE	BFS	11/15/90	1330	109250	HHP			9.0		880		5.44
MCBRIDE	D	11/15/90	1300	109244	HHP	6.0	6.7	7.3	360	355	216	
MCBRIDE	N	11/15/90	1245	109245	HHP	5.5	6.6	7.1	346	359	216	
MCBRIDE	XCB	11/15/90	1315	109243	HHP	6.0	3.6	5.5	6	10	8	U

- NOTES:
- 1) Sample types are defined as: BFS - blind field standard, B - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
  - 2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection, Z - value not usable for statistics.
  - 3) Blanks indicate values not determined.
  - 4) Sampling methods are defined as: BAIL - bailed, HHP - hand-HIT pump, HMP - mechanically pumped.

INDUSVILLE GROUNDWATER DATA  
dissolved metals

Station	Sample Type	Sample Date	Sample Time	Aluminum (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Cadmium (mg/l)	Chromium (mg/l)	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)
AAAX-2	LD	11/30/90		127.0	0.002	0.2	0.8270	0.240	13.00	1570.00	0.002
AAAX-2	N	11/14/90	1650	128.0	0.002	0.2	0.8300	0.230	13.00	1550.00	0.002
HW-01	N	11/15/90	0900	0.9	0.002	0.1	0.2270	0.002	0.08	166.00	0.001
HW-02	N	11/14/90	1615	87.0	0.002	0.3	1.0900	0.024	17.00	1260.00	0.030
HW-03	N	11/15/90	0950	0.1	0.002	0.1	0.0002	0.014	0.02	0.08	0.001
HW-04	N	11/15/90	1100	0.1	0.002	0.1	0.0013	0.014	0.02	0.05	0.001
HW-05	N	11/15/90	0940	0.9	0.002	0.1	0.1190	0.002	0.02	135.00	0.002
HW-06	N	11/14/90	1300	14.0	0.002	0.1	0.4400	0.007	1.64	143.00	0.006
HW-08	BFS	11/14/90	1115	0.2	0.002	0.2	0.1000	0.130	0.28	0.17	0.008
HW-08	N	11/14/90	1055	1.3	0.002	0.1	0.0950	0.002	0.02	78.00	0.800
HW-08	N	11/25/90		1.4	0.002	0.1	0.0920	0.002	0.02	71.00	0.800
HW-08	N	11/14/90	1045	0.1	0.002	0.1	0.0960	0.002	0.02	70.00	0.860
ACBRIDE	BFS	11/15/90	1330	0.2	0.002	0.1	0.0038	0.002	0.02	0.09	0.001
ACBRIDE	D	11/15/90	1300	0.1	0.002	0.1	0.1020	0.140	0.26	0.18	0.002
ACBRIDE	N	11/15/90	1245	0.1	0.002	0.1	0.0002	0.002	0.02	1.36	0.001
ACBRIDE	N	11/15/90	1245	0.1	0.002	0.1	0.0002	0.002	0.02	1.74	0.001
ACBRIDE	XC	11/15/90	1315	0.1	0.002	0.1	0.0003	0.002	0.02	0.05	0.001

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XC - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside accuracy range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, / - value not usable for statistics.

3) Blanks indicate values not determined.

HO-HESVILLE GROUNDWATER DATA  
DISSOLVED METALS

Station	Sample Type	Sample Date	Sample Time	Manganese (mg/l)	Artenity (mg/l)	Nickel (mg/l)	Selenium (mg/l)	Silver (mg/l)	Zinc (mg/l)
AMAX-2	LD	11/30/90		490.00	A	0.61			
AMAX-2	N	11/17/90	1650	480.00	A	0.0002	U	0.0003	113.00
HW-01	N	11/15/90	0900	164.00	A	0.0002	U	0.0003	113.00
HW-02	N	11/17/90	1615	320.00	CR	0.0002	U	0.0015	41.00
HW-03	N	11/15/90	0930	0.100	A	0.0002	U	0.0001	110.00
HW-04	N	11/15/90	1100	0.180	A	0.0002	U	0.0002	0.02
HW-05	N	11/17/90	0940	86.000	CR	0.0002	U	0.0002	0.25
HW-06	N	11/17/90	1300	89.000	CR	0.0002	U	0.0010	58.00
HW-08	BFS	11/14/90	1115	0.170	U	0.18	U	0.0005	73.00
HW-08	D	11/14/90	1055	50.000	CR	0.0049	U	0.0005	0.20
HW-08	LD	11/29/90		46.000	CR	0.0002	U	0.0005	24.00
HW-08	N	11/14/90	1045	45.000	CR	0.0002	U	0.0004	23.00
ACRIDE	XCB	11/14/90	1105	0.030	C	0.12	U	0.0008	23.00
ACRIDE	BFS	11/15/90	1300	0.085	U	0.0002	U	0.0006	0.02
ACRIDE	D	11/15/90	1245	0.100	A	0.0002	U	0.0008	0.20
ACRIDE	N	11/15/90	1245	0.100	A	0.0002	U	0.0012	0.04
ACRIDE	XCB	11/15/90	1315	0.020	U	0.0002	U	0.0007	0.04
ACRIDE						0.02	U	0.0070	0.02

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.  
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicate outside expected range, U - less than detection limit, Z - value not useable for statistics.  
3) Blanks indicate values not determined.



PEABODYVILLE GROUNDWATER DATA  
Various Data

Station	Sample Type	Sample Date	Sample Time	Total Alkalinity as CaCO <sub>3</sub> (mg/l)	Bicarbonate Alkalinity HCO <sub>3</sub> <sup>-</sup> (mg/l)	Carbonate Alkalinity CO <sub>3</sub> <sup>2-</sup> (mg/l)	Hydroxide Alkalinity as OH <sup>-</sup> (mg/l)	Chloride as Cl <sup>-</sup> (mg/l)	Fluoride as F <sup>-</sup> (mg/l)	Nitrate & Nitrite as N (mg/l)	Sulfate as SO <sub>4</sub> (mg/l)
AMAX-2	LD	11/30/90		1	1	0	0	2	0.16	0.03	5860
HWR-01	N	11/14/90	1630	1	1	0	0	2	0.14	0.03	5900
HWR-01	N	11/15/90	0900	1	1	0	0	1	0.62	0.03	1690
HWR-02	N	11/14/90	1615	1	1	0	0	1	0.18	0.03	4980
HWR-03	N	11/15/90	0950	404	493	0	0	6	0.41	0.30	227
HWR-04	N	11/15/90	1100	35	43	0	0	1	0.16	0.14	72
HWR-05	N	11/14/90	0940	12	15	0	0	4	2.07	0.03	1390
HWR-06	N	11/14/90	1300	1	1	0	0	2	0.62	0.04	1210
HWR-08	BFS	11/14/90	1115	188	229	0	0	320	16.50	3.85	290
HWR-08	D	11/14/90	1055	1	1	0	0	1	0.94	0.31	348
HWR-08	LD	11/29/90	1045	1	1	0	0	1	0.89	0.30	526
HWR-08	N	11/14/90	1105	2	2	0	0	1	0.94	0.05	489
MCBRIDE	BFS	11/15/90	1300	201	245	0	0	1	0.10	0.15	3
MCBRIDE	D	11/15/90	1300	155	164	0	0	1	16.50	3.80	310
MCBRIDE	N	11/15/90	1245	162	198	0	0	1	0.21	0.07	26
MCBRIDE	N	11/15/90	1315	4	5	0	0	1	0.20	0.03	22
MCBRIDE	XCB	11/15/90				0	0	1	0.10	0.15	1

NOTES: 1) Sample types are defined as: BFS = blind field standard, D = field duplicate, LD = field duplicate, N = natural, XCB = cross-contamination blank.

2) Data-quality analysis codes are defined as: A = blind field standard outside expected range, B = blind field standard outside expected range, C = cross-contamination blank equal to or above detection limit, N = laboratory spike recovery outside control limits, R = field duplicates outside expected range, U = less than detection limit, Z = value not usable for statistics.

3) Blanks indicate values not determined.

TEXASWELL GROUNDWATER DATA  
Cation Data

Station	Sample Type	Sample Date	Sample Time	Hardness as CaCO <sub>3</sub> (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Sodium (mg/l)	Potassium (mg/l)
AAAX-2	LD	11/30/90			270	113		
AAAX-2	N	11/14/90	1650	1183	276	120	27	3
AAAX-2	N	11/15/90	0900	1087	319	76	10	3
AAAX-2	N	11/14/90	1615	1302	327	118	27	4
AAAX-2	N	11/15/90	0750	194	43	21	195	16
AAAX-2	N	11/15/90	1100	104	25	10	3	1
AAAX-2	N	11/14/90	0940	934	224	91	29	4
AAAX-2	N	11/14/90	1300	775	205	64	22	2
AAAX-2	N	11/14/90	1115	544	132	52	290	272
AAAX-2	N	11/14/90	1055	315	85	25	7	2
AAAX-2	N	11/29/90			86	25	8	2
AAAX-2	N	11/14/90	1045	311	69	24	8	2
AAAX-2	N	11/14/90	1105	7	1	1	1	1
AAAX-2	N	11/15/90	1310	537	131	51	290	272
AAAX-2	N	11/15/90	1300	192	54	14	2	1
AAAX-2	N	11/15/90	1245	197	56	14	2	1
AAAX-2	N	11/15/90	1315	7	1	1	1	1

NOTES: 1) Sample types are defined as: NLS = Blind Field Control, LD = Field duplicate, LD = Lab duplicate, N = Natural, XCB = Cross-contamination blank.

2) Data-quality analysis codes are defined as: A = Blind Field standard outside advisory range, C = Cross-contamination blank equal to or above detection limit.

N = Laboratory spike recovery outside control limits, E = Field duplicate outside expected range, U = Less than detection limit, Z = value not usable for statistics.

3) Blanks indicate values not determined.



APPENDIX C-2

SOILS/MINE WASTE LABORATORY, GRADATION, AND  
HYDROMETER DATA BASE

INKOESVILLE SOILS/WINE WASTE LABORATORY ANALYSES  
Physical Properties

Station	Type	Sample Type	Sample Date	Lab Number	Top Interval (Inches)	Bottom Interval (Inches)	Field pH (s.u.)	Electrical Conductivity (Dse/mhos/cm)	Sample Texture	Percent Saturation
SS-100	N	STREAM TAILS	10/16/90	109061	0	1	2.7	0.8	LOAMY SAND	21.4
SS-102	N	STREAM TAILS	10/16/90	109064	0	1	3.0	2.4	LOAMY SAND	23.3
SS-105	N	STREAM TAILS	10/16/90	109067	0	1	2.9	0.5		21.1
SS-107	N	MILL TAILS	10/16/90	109070	0	1	1.6	37.3	SANDY LOAM	21.6
SS-107	LD	MILL TAILS	10/16/90	109070	0	1	1.6	38.1	SANDY LOAM	22.4
SS-109	N	MILL TAILS	10/16/90	109072	0	1	1.4	45.7	SANDY LOAM	29.1
SS-110	N	MILL TAILS	10/16/90	109056	0	1	1.6	29.6	LOAM	31.8
SS-112	N	MILL TAILS	10/16/90	109059	0	1	1.6	30.0	CLAY LOAM	35.4
SS-115	N	WASTE ROCK	10/17/90	109032	0	1	2.2	3.2	LOAMY SAND	23.7
SS-117	N	WASTE ROCK	10/17/90	109034	0	1	2.2	1.5	SANDY LOAM	25.9
SS-124	N	WASTE ROCK	10/17/90	109040	0	1	2.1	2.7	SANDY LOAM	28.9
SS-124	N	WASTE ROCK	10/17/90	109040	0	1	2.1	2.6	SANDY LOAM	30.1
SS-130	N	WASTE ROCK	10/18/90	109043	0	1	2.6	0.2	SANDY LOAM	30.0
SS-133	N	STREAM TAILS	10/18/90	109045	0	1	2.0	4.0	SANDY LOAM	25.0
SS-135	N	WASTE ROCK	10/18/90	109048	0	1	1.9	4.1	LOAMY SAND	25.5
SS-137	N	WASTE ROCK	10/18/90	109102	0	1	5.3	4.7	SANDY LOAM	25.7
SS-137	N	WASTE ROCK	10/18/90	109283	0	1				
SS-150	BFS	STANDARD	11/19/90	109284	0	18	2.6	0.9		32.7
SS-160	BFS	STANDARD	10/16/90	109062	1	6	2.9	0.4		26.1
SS-100	N	STREAM TAILS	10/16/90	109068	1	6	1.6	25.9	LOAMY SAND	23.5
SS-107	N	MILL TAILS	10/16/90	109071	1	48	1.6	35.6	LOAMY SAND	24.9
SS-109	N	MILL TAILS	10/16/90	109053	1	12	1.9	4.5	LOAMY SAND	24.0
SS-124	N	WASTE ROCK	10/17/90	109041	1	24	4.6	11.0	SANDY LOAM	31.0
SS-137	N	WASTE ROCK	10/18/90	109103	1	24	2.2	0.8	SANDY LOAM	34.9
SS-133	N	STREAM TAILS	10/18/90	109046	3	12	3.8	3.4	SANDY LOAM	37.4
SS-105	N	SOIL	10/16/90	109069	6	12	4.1	3.2	SAND	30.3
SS-102	N	STREAM TAILS	10/16/90	109065	8	48	4.1	3.2		24.4
SS-134	N	SOIL	10/17/90	109047	10	22	2.3	1.3	SANDY LOAM	27.4
SS-115	N	WASTE ROCK	10/17/90	109033	12	36	2.1	4.7	LOAMY SAND	27.6
SS-124	N	WASTE ROCK	10/17/90	109042	12	40	2.1	1.6	SANDY LOAM	35.1
SS-130	N	WASTE ROCK	10/18/90	109044	12	30	2.0	2.7		

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.  
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not suitable for statistics.  
3) Blanks indicate values not determined.

# INDIESVILLE SOILS/AIR/WASTE LABORATORY ANALYSES Physical Properties

Station	Type	Sample Type	Sample Date	Lab Number	Top Interval (Inches)	Bottom Interval (Inches)	Field pH (S.U.)	Electrical Conductivity (Diss/cm/cm)	Sample Texture	Percent Saturation
SS-135	N	WASTE ROCK	10/18/90	109049	15	36	1.8	6.3	SANDY LOAM	27.4
SS-135	D	WASTE ROCK	10/18/90	109050	15	36	1.9	5.4		27.9
SS-135	LD	WASTE ROCK	10/18/90	109050	15	36	1.9	5.3		29.9
SS-100	N	SOIL	10/16/90	109063	18	26	3.2	0.6		30.1
SS-117	N	WASTE ROCK	10/17/90	109035	18	36	2.4	3.4	SANDY LOAM	37.6
SS-121	N	WASTE ROCK	10/17/90	109037	18	36	2.1	4.8		33.4
SS-121	D	WASTE ROCK	10/17/90	109038	18	36	2.0	5.7		37.8
SS-137	N	WASTE ROCK	10/15/90	109104	24	48	1.6	1.7		32.8
SS-110	N	MILL TAILS	10/16/90	109057	30	54	1.6	44.0	LOAMY SAND	24.0
SS-117	N	WASTE ROCK	10/17/90	109036	30	48	2.2	4.0	SANDY LOAM	34.3
SS-102	N	STREAM TAILS	10/16/90	109066	48	60	4.0	0.5	LOAMY SAND	36.7
SS-109	N	MILL TAILS	10/16/90	109054	48	66	1.8	20.7	LOAMY SAND	23.0
SS-107	N	MILL TAILS	10/16/90	109051	66	72	1.6	14.4		38.1
SS-110	N	MILL TAILS	10/16/90	109055	66	132	1.7	20.1	SANDY LOAM	23.9
SS-109	N	MILL TAILS	10/16/90	109058	64	90	4.0	27.0	SILT LOAM	35.8
HW5	N	WASTE ROCK	11/07/90	109105	120	132	2.6	6.7		24.6
SS-112	N	MILL TAILS	10/17/90	109039	156	178	1.5	29.4	SILT LOAM	75.2
SS-112	N	SOIL	10/16/90	109060	216	222	1.8	20.1	SANDY LOAM	33.2
SS-112	LD	SOIL	10/16/90	109060	216	222	1.8	28.6		33.4
HW5	N	WASTE ROCK	11/07/90	109106	360	384	1.8	11.5		23.7

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCH - cross-contamination blank.  
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.  
3) Blanks indicate values not determined.

INGERSVILLE SOILS/AIR/NE WASTE LABORATORY ANALYSES  
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Aluminum (mg/kg)	Aluminum Extract (mg/l)	Arsenic Total (mg/kg)	Arsenic Extract (mg/l)	Cadmium Total (mg/kg)	Cadmium Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	2410	2.0	920	A	23.0	0.655
SS-102	N	STREAM TAILS	10/16/90	0	1	2510	0.5	610	A	9.0	0.061
SS-103	N	STREAM TAILS	10/16/90	0	1	1610	0.9	690	A	12.0	0.272
SS-107	N	MILL TAILS	10/16/90	0	1	1610	1050.0	540	A	13.0	4.920
SS-107	LD	MILL TAILS	10/16/90	0	1	1620	1090.0	520	A	13.0	4.630
SS-109	N	MILL TAILS	10/16/90	0	1				A		
SS-110	N	MILL TAILS	10/16/90	0	1	5600	1870.0	920	A	15.0	9.100
SS-112	N	MILL TAILS	10/16/90	0	1	2290		720	A	7.4	
SS-115	N	WASTE ROCK	10/17/90	0	1	1910	11.0	299	A	8.1	0.075
SS-117	N	WASTE ROCK	10/17/90	0	1	3220	58.0	365	A	17.2	0.330
SS-124	N	WASTE ROCK	10/17/90	0	1	2980	58.0	388	A	17.0	0.235
SS-124	LD	WASTE ROCK	10/17/90	0	1	2390	0.4	510	A	14.0	0.013
SS-130	N	WASTE ROCK	10/18/90	0	1	1830	15.0	2010	A	44.0	1.520
SS-133	N	STREAM TAILS	10/18/90	0	1	2000	11.0	220	A	9.2	0.200
SS-135	N	WASTE ROCK	10/18/90	0	1	4400			A		
SS-137	N	WASTE ROCK	10/13/90	0	1	13600		70		37.0	
SS-150	N	STANDARD	11/19/90	0		13300		73		42.7	
SS-160	BFS	STANDARD	11/19/90	0		5160	4.0	2040	A	17.0	0.474
SS-100	N	STREAM TAILS	10/16/90	1	18	3290		1050	A	12.0	
SS-105	N	STREAM TAILS	10/16/90	1	6	1200	200.0	730	A	22.0	2.370
SS-107	N	MILL TAILS	10/16/90	1	66				A		
SS-109	N	MILL TAILS	10/16/90	1	48				A		
SS-124	N	WASTE ROCK	10/17/90	1	12	1750	37.0	311	A	7.6	0.250
SS-137	N	WASTE ROCK	10/13/90	1	24	3920		490	A	28.0	
SS-133	N	STREAM TAILS	10/18/90	3	24	2130		1600	A	11.0	
SS-103	N	SOIL	10/16/90	6	12	6090		1910	A	25.0	
SS-102	N	STREAM TAILS	10/16/90	8	48	7390	1.5	160	A	14.0	1.200
SS-134	N	SOIL	10/16/90	10	22	5410		897	A	10.0	
SS-115	N	WASTE ROCK	10/17/90	12	36	2400		324	A	5.9	

NOTES: 1) Sample types are defined as: BFS = blind field standard, 0 = field duplicate, 10 = lab duplicate, N = natural, XCB = cross-contamination blank.

2) Data-quality analysis codes are defined as: A = blind field standard outside advisory range, C = cross-contamination blank equal to or above detection limit, N = laboratory spike recovery outside control limits, R = field duplicate outside expected range, U = less than detection limit, Z = value not usable for statistics.

3) Blanks indicate values not determined.



HOCHESVILLE SOILS/MINE WASTE LABORATORY ANALYSIS  
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Aluminum Total (mg/kg)	Aluminum Extract (mg/l)	Arsenic Total (mg/kg)	Arsenic Extract (mg/l)	Cadmium Total (mg/kg)	Cadmium Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	2410	2.1	380	0.023	4.4	0.024
SS-130	N	WASTE ROCK	10/18/90	12	30	2360		840		16.0	
SS-135	N	WASTE ROCK	10/18/90	15	36	2090	30.0	116	0.407	10.0	0.698
SS-135	D	WASTE ROCK	10/18/90	15	36	3150	16.0	160	0.341	12.0	0.606
SS-135	LD	WASTE ROCK	10/18/90	15	36	3190	16.0	164	0.253	14.0	0.596
SS-100	N	SOIL	10/16/90	18	26	13700		6		9.0	
SS-117	N	WASTE ROCK	10/17/90	18	36	2620	59.0	312	0.040	8.3	0.368
SS-121	N	WASTE ROCK	10/17/90	18	36	3910	74.0	437	0.110	8.4	0.339
SS-121	D	WASTE ROCK	10/17/90	18	36	4370	78.0	1030	0.400	9.9	0.238
SS-137	N	WASTE ROCK	10/15/90	24	48	1810		670		25.0	
SS-110	N	MILL TAILS	10/16/90	36	54						
SS-117	N	WASTE ROCK	10/17/90	36	48	2360	29.0	312	0.076	11.3	0.346
SS-102	N	STREAM TAILS	10/16/90	48	60	9110		16		20.0	
SS-109	N	MILL TAILS	10/16/90	48	66	1820	250.0	698	13.000	27.0	1.680
SS-107	N	MILL TAILS	10/16/90	66	72	6470		500		9.7	
SS-109	N	MILL TAILS	10/16/90	66	132	2220	390.0	2140	370.000	68.0	3.710
SS-110	N	MILL TAILS	10/16/90	84	90						
SS-110	N	WASTE ROCK	11/07/90	120	132	4040		560		18.8	
SS-112	N	MILL TAILS	10/17/90	156	178	5550	1400.0	1380	500.000	17.1	9.900
SS-112	N	SOIL	10/16/90	216	222	10700	1380.0	640	200.000	12.0	5.800
SS-112	LD	SOIL	10/16/90	216	222	10800	1200.0	640	200.000	12.0	5.500
HW5	N	WASTE ROCK	11/07/90	360	384	3410		340		9.7	

NOTES: 1) Sample types are defined as: BRS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

HAZARDOUS SOILS/MINE WASTE LABORATORY ANALYSIS  
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Chromium Total (mg/kg)	Chromium Extract (mg/l)	Copper Extract (mg/l)	Iron Total (mg/kg)	Iron Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	2	U	0.54	23200	7.20
SS-102	N	STREAM TAILS	10/16/90	0	1	2	U	0.29	22900	0.37
SS-105	N	STREAM TAILS	10/16/90	0	1	2	U	0.32	26100	1.30
SS-107	N	MILL TAILS	10/16/90	0	1	2	U	44.00	30700.00	30700.00
SS-107	LO	MILL TAILS	10/16/90	0	1	2	U	43.00	31100.00	31100.00
SS-109	N	MILL TAILS	10/16/90	0	1	2	U			
SS-110	N	MILL TAILS	10/16/90	0	1	4	2.06	116.00	50400	43800.00
SS-112	N	MILL TAILS	10/16/90	0	1	3	0.08	0.66	30700	8.00
SS-115	N	WASTE ROCK	10/17/90	0	1	2	0.15	0.60	29100	45.00
SS-117	N	WASTE ROCK	10/17/90	0	1	4	0.10	0.55	27300	43.00
SS-124	N	WASTE ROCK	10/17/90	0	1	3	0.02	0.12	25900	0.41
SS-130	N	WASTE ROCK	10/16/90	0	1	2	U	3.65	33100	170.00
SS-133	N	STREAM TAILS	10/16/90	0	1	34	0.04	0.71	65400	220.00
SS-135	N	WASTE ROCK	10/16/90	0	1	2	U		17400	
SS-137	N	WASTE ROCK	10/15/90	0	1	26	0.04		134000	
SS-150	BFS	STANDARD	11/16/90	0		50			19500	
SS-160	BFS	STANDARD	11/16/90	0		51			19800	9.60
SS-100	N	STREAM TAILS	10/16/90	1	18	10	0.02	1.00	60000	
SS-105	N	STREAM TAILS	10/16/90	1	6	2	U	18.00	34400	9850.00
SS-107	N	MILL TAILS	10/16/90	1	66	2	U		78400	
SS-109	N	MILL TAILS	10/16/90	1	48	2	U	0.45	16600	181.00
SS-124	N	WASTE ROCK	10/17/90	1	12	2	U		120000	
SS-137	N	WASTE ROCK	10/15/90	1	24	26			25200	
SS-133	N	STREAM TAILS	10/16/90	3	24	4			73600	
SS-105	N	SOIL	10/16/90	6	12	12		1.20	37300	0.19
SS-102	N	STREAM TAILS	10/16/90	8	48	14	0.12		37000	
SS-134	N	SOIL	10/16/90	10	22	10			27500	
SS-115	N	WASTE ROCK	10/17/90	12	36	2	76			

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LO - lab duplicate, N - Natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not suitable for statistics.

3) Blanks indicate values not determined.

INCHESVILLE SOILS/MINE WASTE LABORATORY ANALYSIS  
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Chromium Total (mg/kg)	Chromium Extract (mg/l)	Copper Total (mg/kg)	Copper Extract (mg/l)	Iron Total (mg/kg)	Iron Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	2	0.02	11	0.19	15700	5.80
SS-130	N	WASTE ROCK	10/18/90	12	30	2	U	172		40100	
SS-135	N	WASTE ROCK	10/18/90	15	36	2	0.05	129	2.22	15400	490.00
SS-135	D	WASTE ROCK	10/18/90	15	36	2	0.04	158	1.49	17900	350.00
SS-135	LD	WASTE ROCK	10/18/90	15	36	2	0.05	160	1.59	18500	360.00
SS-100	N	SOIL	10/16/90	18	26	47		187		23500	
SS-117	N	WASTE ROCK	10/17/90	18	36	4	0.09	93	2.12	29300	9.70
SS-121	N	WASTE ROCK	10/17/90	18	36	6	0.12	32	1.60	41100	82.00
SS-137	D	WASTE ROCK	10/15/90	18	36	7	0.05	37	2.10	54900	230.00
SS-110	N	MILL TAILS	10/17/90	24	48	7		845		148000	
SS-117	N	WASTE ROCK	10/17/90	36	54	3	0.04	111	1.01	39600	47.00
SS-102	N	STREAM TAILS	10/16/90	48	60	20		369		12300	
SS-109	N	MILL TAILS	10/16/90	48	66	2	0.66	157	23.00	91500	4900.00
SS-107	N	MILL TAILS	10/16/90	66	72	7		79		27300	
SS-109	N	MILL TAILS	10/16/90	66	132	2	3.53	688	290.00	141000	8100.00
SS-110	N	MILL TAILS	10/16/90	84	90						
FWWS	N	WASTE ROCK	11/07/90	120	132	7		106		37800	
SS-112	N	MILL TAILS	10/17/90	156	178	10	4.10	314	305.00	81000	48200.00
SS-112	N	SOIL	10/16/90	216	222	14	3.28	190	150.00	32800	16400.00
SS-112	LD	SOIL	10/16/90	216	222	14	3.15	190	130.00	33900	14700.00
FWWS	N	WASTE ROCK	11/07/90	360	384	7		55		39700	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

IRKSHESVILLE SOILS/MINE WASTE LABORATORY ANALYSES  
Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Lead Total (mg/kg)	Lead Extract (mg/l)	Manganese Total (mg/kg)	Manganese Extract (mg/l)	Mercury Total (mg/kg)	Mercury Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	13500	2.57	28	3.00	0.72	0.002 U
SS-102	N	STREAM TAILS	10/16/90	0	1	6130	0.13	38	0.35	0.27	0.013
SS-105	N	STREAM TAILS	10/16/90	0	1	12200	5.90	26	1.79	0.62	0.002 U
SS-107	N	MILL TAILS	10/16/90	0	1	4340	2.41	26	3.11	0.35	0.002 U
SS-107	LD	MILL TAILS	10/16/90	0	1	4000	2.46	18	3.47	0.36	0.002 U
SS-109	N	MILL TAILS	10/16/90	0	1						
SS-110	N	MILL TAILS	10/16/90	0	1	10600	0.47	1630	6100.00	0.42	0.002 U
SS-112	N	MILL TAILS	10/16/90	0	1	11100		38		0.20	
SS-115	N	WASTE ROCK	10/17/90	0	1	10200	4.32	16	2.08	0.66	0.004
SS-117	N	WASTE ROCK	10/17/90	0	1	34600	3.40	39	17.00	0.52	0.002 U
SS-124	N	WASTE ROCK	10/17/90	0	1	40700	3.50	36	15.00	0.52	0.002 U
SS-130	LD	WASTE ROCK	10/17/90	0	1	34000	5.50	29	0.12	2.80	0.011
SS-133	N	STREAM TAILS	10/18/90	0	1	18000	1.17	63	1.90	2.10	0.004 U
SS-135	N	WASTE ROCK	10/18/90	0	1	22000	3.03	13	1.46	0.51	0.002 U
SS-137	N	WASTE ROCK	10/15/90	0	1	8690		15600		0.07	
SS-150	BFS	STANDARD	11/19/90	0	32			350		1.20	
SS-160	BFS	STANDARD	11/19/90	0	30			350		1.40	
SS-160	N	STREAM TAILS	10/16/90	1	18	6340	0.16	180	2.20	0.36	0.045
SS-160	N	STREAM TAILS	10/16/90	1	6	18500		76		0.85	
SS-165	N	MILL TAILS	10/16/90	1	66	2310	3.66	6	1.90	0.45	0.004
SS-169	N	MILL TAILS	10/16/90	1	48						
SS-169	N	WASTE ROCK	10/17/90	1	12	3270	2.70	9	5.05	0.20	0.002 U
SS-124	N	WASTE ROCK	10/15/90	1	24	1740		5100		0.27	
SS-137	N	WASTE ROCK	10/16/90	3	24	18000		40		1.30	
SS-133	N	STREAM TAILS	10/16/90	6	12	1540		10900		0.24	
SS-105	N	SOIL	10/16/90	8	48	451	0.29	1340	58.00	0.05	0.003
SS-102	N	STREAM TAILS	10/16/90	10	22	1030		1410		0.07	
SS-134	N	SOIL	10/18/90	12	36	4050		45		0.44	

NOTES: 1) Sample types are defined as: BFS = blind field standard, D = field duplicate, LD = lab duplicate, N = natural, XCB = cross-contamination blank.

2) Data-quality analysis codes are defined as: A = blind field standard outside advisory range, C = cross-contamination blank equal to or above detection limit, N = laboratory spike recovery outside control limits, R = field duplicates outside expected range, U = less than detection limit, Z = value not useable for statistics.

3) Blanks indicate values not determined.

# HAZARDOUS WASTE LABORATORY ANALYSIS DATA Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Lead Total (mg/kg)	Lead Extract (mg/l)	Manganese Total (mg/kg)	Manganese Extract (mg/l)	Mercury Total (mg/kg)	Mercury Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	291	0.17	8	0.68	0.44	0.002 U
SS-130	N	WASTE ROCK	10/18/90	12	30	9170		38		1.80	
SS-135	N	WASTE ROCK	10/18/90	15	36	12200	2.55	31	17.00	1.60	0.002 U
SS-135	D	WASTE ROCK	10/18/90	15	36	22800	2.55	28	7.30	1.90	0.003
SS-135	LD	WASTE ROCK	10/18/90	15	36	22800	2.81	29	7.40	1.80	0.002
SS-100	N	SOIL	10/16/90	18	26	91		123		0.07	
SS-117	N	WASTE ROCK	10/17/90	18	36	23600	2.13	34	3.58	1.40	0.002 U
SS-121	N	WASTE ROCK	10/17/90	18	36	4210	2.07	26	2.64	0.59	0.002
SS-121	D	WASTE ROCK	10/17/90	18	36	9360	1.43	29	3.13	0.73	5.020
SS-137	N	WASTE ROCK	10/15/90	24	48	4100		2040		0.32	
SS-110	N	MILL TAILS	10/16/90	36	54	24600		31	3.73	1.30	0.002 U
SS-117	N	WASTE ROCK	10/17/90	36	48			94		0.08	
SS-102	N	STREAM TAILS	10/16/90	48	60	408		67	280.00	0.44	0.002 U
SS-109	N	MILL TAILS	10/16/90	48	66	2070	2.92	10		0.20	
SS-107	N	MILL TAILS	10/16/90	66	72	2810		115	420.00	0.94	0.002 U
SS-109	N	MILL TAILS	10/16/90	66	132	4460	8.00				
SS-110	N	MILL TAILS	10/16/90	84	90			216		0.64	
HW5	N	WASTE ROCK	11/07/90	120	132	11500		3290	8700.00	1.00	1.250
SS-112	N	MILL TAILS	10/17/90	156	178	10000	2.40			0.10	0.020 U
SS-112	N	SOIL	10/16/90	216	222	720	0.20	1400	5100.00	0.10	0.020 U
SS-112	LD	SOIL	10/16/90	216	222	680	0.53	1440	4850.00	0.10	0.020 U
HW5	N	WASTE ROCK	11/07/90	360	384	1490		49		0.26	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

# HOOGESVILLE SOILS/MINE WASTE LABORATORY ANALYSES Total and Saturated Paste Extract Metals Data

Station	Type	Sample Type	Sample Date	Top Interval (inches)	Bottom Interval (inches)	Nickel Total (mg/kg)	Nickel Extract (mg/l)	Silver Total (mg/l)	Silver Extract (mg/l)	Zinc Total (mg/kg)	Zinc Extract (mg/l)
SS-100	N	STREAM TAILS	10/16/90	0	1	13.0	A	0.02	U	3010	U
SS-102	N	STREAM TAILS	10/16/90	0	1	10.0	A	0.02	U	553	U
SS-103	N	STREAM TAILS	10/16/90	0	1	11.0	A	0.02	U	1450	U
SS-107	N	MILL TAILS	10/16/90	0	1	14.0	A	3.98	0.24	636	0.24
SS-107	LD	MILL TAILS	10/16/90	0	1	16.0	A	4.17	0.25	588	0.25
SS-109	N	MILL TAILS	10/16/90	0	1						
SS-110	N	MILL TAILS	10/16/90	0	1	14.0		5.71	0.84	731	0.84
SS-112	N	MILL TAILS	10/16/90	0	1	5.0	A			25	
SS-115	N	WASTE ROCK	10/17/90	0	1	3.0	A	0.06		36	
SS-117	N	WASTE ROCK	10/17/90	0	1	5.0	A	0.15		104	
SS-124	N	WASTE ROCK	10/17/90	0	1	5.0	A	0.25		107	
SS-124	LD	WASTE ROCK	10/17/90	0	1	8.0		0.04		176	
SS-130	N	WASTE ROCK	10/18/90	0	1	17.0		0.15		440	
SS-133	N	STREAM TAILS	10/18/90	0	1	13.0		0.13		43	
SS-135	N	WASTE ROCK	10/18/90	0	1	42.0				132	
SS-137	N	WASTE ROCK	10/15/90	0	1	120.0				76	
SS-150	BFS	STANDARD	11/19/90	0		130.0				83	
SS-160	BFS	STANDARD	11/19/90	0		28.0	A	0.02		60	
SS-100	N	STREAM TAILS	10/16/90	1	18	12.0	A		0.02	U	U
SS-103	N	STREAM TAILS	10/16/90	1	6	22.0	A	1.45		156	
SS-107	N	MILL TAILS	10/16/90	1	66				0.26	950	
SS-109	N	MILL TAILS	10/16/90	1	48						
SS-124	N	WASTE ROCK	10/17/90	1	12	6.0	A	0.10		262	
SS-137	N	WASTE ROCK	10/15/90	1	24	30.0				39	
SS-133	N	STREAM TAILS	10/18/90	3	24	10.0				33	
SS-105	N	SOIL	10/16/90	6	12	27.0	A			170	
SS-105	N	STREAM TAILS	10/16/90	8	48	24.0	A	0.19		16	
SS-102	N	SOIL	10/18/90	10	22	16.0			0.03	1220	
SS-134	N	WASTE ROCK	10/17/90	12	36	6.0	A			4	
SS-115	N									18	

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.

INDUSTRIAL SOILS/MINE WASTE LAP ANALYSIS RESULTS  
Total and Saturated Paste Extract - 10/16/90

Station	Type	Sample Type	Sample Date	Top Interval (Inches)	Bottom Interval (Inches)	Nickel Total (mg/kg)	Copper Extract (mg/l)	Silver Total (mg/kg)	Silver Extract (mg/l)	Zinc Total (mg/kg)	Zinc Extract (mg/l)
SS-124	N	WASTE ROCK	10/17/90	12	40	8.0	A	4	0.02	78	3.88
SS-126	N	WASTE ROCK	10/16/90	12	30	10.0		96		626	
SS-128	N	WASTE ROCK	10/16/90	15	36	8.0	0.21	56	0.02	1000	98.00
SS-130	N	WASTE ROCK	10/16/90	15	36	10.0	0.15	115	0.02	1680	80.00
SS-132	D	WASTE ROCK	10/16/90	15	36	10.0	0.16	106	0.02	2000	82.00
SS-134	LD	WASTE ROCK	10/16/90	18	26	37.0		2		478	
SS-136	N	SOIL	10/16/90	18	36	7.0	A	56	0.02	340	54.00
SS-138	N	WASTE ROCK	10/17/90	18	36	4.0	A	26	0.11	313	34.00
SS-140	N	WASTE ROCK	10/17/90	18	36	8.0	A	21	0.02	184	36.00
SS-142	D	WASTE ROCK	10/17/90	24	48	22.0		52		503	
SS-144	N	WASTE ROCK	10/16/90	36	54	9.7	A	74	0.02	975	66.00
SS-146	N	MILL TAILS	10/16/90	36	48	22.0	A	2		858	
SS-148	N	STREAM TAILS	10/16/90	48	60	22.0		66	0.14	905	100.00
SS-150	N	MILL TAILS	10/16/90	66	72	12.0	A	19		562	
SS-152	N	MILL TAILS	10/16/90	66	132	38.0		113	0.30	76	390.00
SS-154	N	MILL TAILS	10/16/90	84	90						
SS-156	N	MILL TAILS	10/16/90	120	132	8.9	A	64		2800	
SS-158	N	WASTE ROCK	10/17/90	156	178	13.0		54	1.25	860	930.00
SS-160	N	MILL TAILS	10/17/90	216	222	18.0		6	0.89	321	660.00
SS-162	N	SOIL	10/16/90	216	222	21.0		6	0.84	321	550.00
SS-164	LD	SOIL	10/16/90	360	384	9.0	A	8		204	
SS-166	N	WASTE ROCK	11/07/90								

NOTES: 1) Sample types are defined as: BWS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.

2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.

3) Blanks indicate values not determined.



# HUGHESVILLE SOILS/MINE WASTE LABORATORY ANALYSIS Sulfur Fractionation

Station	Type	Sample Type	Sample Date	Top Interval	Bottom Interval	Total Sulfur (%)	Sulfate Sulfur (%)	Jarosite Sulfur (%)	Pyritic Sulfur (%)	Residual Sulfur (%)
SS-100	N	STREAM TAILS	10/16/90	0	1					
SS-102	N	STREAM TAILS	10/16/90	0	1					
SS-105	N	STREAM TAILS	10/16/90	0	1					
SS-107	N	MILL TAILS	10/16/90	0	1	3.82	0.74	0.45	1.39	1.25
SS-107	LD	MILL TAILS	10/16/90	0	1	3.83	0.71	0.45	1.21	1.46
SS-109	N	MILL TAILS	10/16/90	0	1					
SS-110	N	MILL TAILS	10/16/90	0	1					
SS-112	N	MILL TAILS	10/16/90	0	1					
SS-115	N	WASTE ROCK	10/17/90	0	1					
SS-117	N	WASTE ROCK	10/17/90	0	1					
SS-124	N	WASTE ROCK	10/17/90	0	1					
SS-124	LD	WASTE ROCK	10/17/90	0	1					
SS-130	N	WASTE ROCK	10/18/90	0	1					
SS-133	N	STREAM TAILS	10/18/90	0	1					
SS-135	N	WASTE ROCK	10/18/90	0	1					
SS-137	N	WASTE ROCK	10/15/90	0	1					
SS-150	BFS	STANDARD	11/19/90	0						
SS-160	BFS	STANDARD	11/19/90	0						
SS-100	N	STREAM TAILS	10/16/90	1	18					
SS-105	N	STREAM TAILS	10/16/90	1	6					
SS-107	N	MILL TAILS	10/16/90	1	66	8.96	0.38	0.29	5.65	2.64
SS-109	N	MILL TAILS	10/16/90	1	48					
SS-124	N	WASTE ROCK	10/17/90	1	12					
SS-137	N	WASTE ROCK	10/15/90	1	24	5.81	1.41	1.41	1.44	1.55
SS-133	N	STREAM TAILS	10/18/90	3	24					
SS-105	N	SOIL	10/16/90	6	12					
SS-102	N	STREAM TAILS	10/16/90	8	48	0.37	0.10	0.02	0.20	0.01
SS-134	N	SOIL	10/18/90	10	22					
SS-115	N	WASTE ROCK	10/17/90	12	36	0.97	0.68	0.09	0.11	0.09

NOTES: 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.  
2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, L - value not useable for statistics.  
3) Blanks indicate values not determined.

MOORESVILLE SOILS/MINE WASTE LABORATORY, INC.  
Sulfur Fractionation

Station	Type	Sample Type	Sample Date	Top Interval	Bottom Interval	Total Sulfur (N)	Sulfur (N)	Sulfur (N)	Sulfur (N)	Sulfur (N)
SS-124	N	WASTE ROCK	10/17/90	12	40					
SS-130	N	WASTE ROCK	10/18/90	12	30	1.58	1.07			0.51
SS-135	N	WASTE ROCK	10/18/90	15	36					
SS-135	D	WASTE ROCK	10/18/90	15	36					
SS-135	LD	WASTE ROCK	10/18/90	15	36					
SS-100	N	SOIL	10/16/90	16	26					
SS-117	N	WASTE ROCK	10/17/90	16	36	1.32	0.87	0.10		0.34
SS-121	N	WASTE ROCK	10/17/90	16	36					
SS-121	D	WASTE ROCK	10/17/90	16	36					
SS-137	N	WASTE ROCK	10/18/90	24	48	5.21	1.59	1.88	0.91	0.83
SS-110	N	MILL TAILS	10/16/90	36	54	9.53	0.13	0.48	7.58	1.34
SS-117	N	WASTE ROCK	10/17/90	36	48	2.29	1.22	0.43	0.30	0.34
SS-102	N	STREAM TAILS	10/16/90	48	60	0.13	0.01	0.07	0.06	0.01
SS-109	N	MILL TAILS	10/16/90	48	66					
SS-107	N	MILL TAILS	10/16/90	66	72					
SS-109	N	MILL TAILS	10/16/90	66	132					
SS-110	N	MILL TAILS	10/16/90	84	90	9.45	0.32	0.91	6.30	1.92
11W5	N	WASTE ROCK	11/07/90	120	132					
SS-112	N	MILL TAILS	10/17/90	156	178	6.22	1.20	1.74	2.30	0.98
SS-112	N	SOIL	10/16/90	216	222					
SS-112	LD	SOIL	10/16/90	216	222					
11W5	N	WASTE ROCK	11/07/90	360	384					

- NOTES:
- 1) Sample types are defined as: BFS - blind field standard, D - field duplicate, LD - lab duplicate, N - natural, XCB - cross-contamination blank.
  - 2) Data-quality analysis codes are defined as: A - blind field standard outside advisory range, C - cross-contamination blank equal to or above detection limit, N - laboratory spike recovery outside control limits, R - field duplicates outside expected range, U - less than detection limit, Z - value not useable for statistics.
  - 3) Blanks indicate values not determined.



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MARCELLINE PA#: 23-022

Date: June 4, 1993 Time: 0830

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: Gwen McBride (Part owner of the  
Block P Mine)

Weather/Seasonality Observations: Overcast; cool; calm; slight  
showers.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: GW-1 sample  
location; #2: SW-1 sample location in Danny T drainage at  
confluence with Galena Creek; #3: SW-2 sample location upgradient  
mine drainage at toe of upgradient dump above Marcelline dumps; #4:  
WR-2; #5: GW-1 (Shaft) and WR-3; #6: WR-3 and WR-4 (background).  
Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):  
N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study water  
treatment alternatives. Pull wastes back from the creek and amend  
and revegetate or place in repository.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MARCELLINE PA#: 23-022

Legal Description: T 15N ; R 9E ; Sec. 7 , SE1/4 NW1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE  
Latitude: N 47° 04' 47" Longitude: W 110° 38' 04"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105  
Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc  
Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Peter Antonioli, Emerald Resources, 1405 Steele, Butte, MT 59701. (406) 723-8730; Jane Tobin, 6761 38th Avenue SW, Seattle, WA 98126. (206) 938-4511; Gwen McBride, P.O. Box 905, Monarch, MT 59643. (406) 791-3109; Harry Anderson, 1900 E. Girard Place #307, Englewood, CO 80010. (303) 789-9556; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district: Block P, Belt Patent, Lucky Strike and several other mines are in close proximity.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? The Hughesville district is listed under CECRA.

General site features: Elevation 5800' , Slope 5°-34° , Aspect West

Land use: Mining X , Recreational X , Residential X , Urban    , Agricultural    , Other (Specify)   

Area of disturbed/unvegetated lands? 2.3 acres.  
Dimensions:   

Predominant vegetation types: Douglas Fir, Lodgepole pine, huckleberry, kinniKinnick

Access: roads - good X , poor    , 4wd    , trail    .  
Other logistical considerations (proximity to other sites). Many of the mines in the Hughesville district are accessed by the same road.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). This site is located on Galena Creek, a  
perennial tributary to the Dry Fork of Belt Creek.

Mining/milling history, ore type/tenor, host rock, gangue: Ore  
deposits are lenses in the Barker porphyry along a contact between  
porphyritic syenite and porphyritic granite. Gangue minerals are  
quartz and calcite. Minerals include galena, colvellite,  
polybasite, tetrahedrite and quartz.

Mine Operation?

Shafts - Yes X, No     , # 1, Comment Partially open  
Adits - Yes X, No     , # 4, Comment 2 open; 2 caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



Montana Bureau of Mines and Geology  
Water Well Log Data

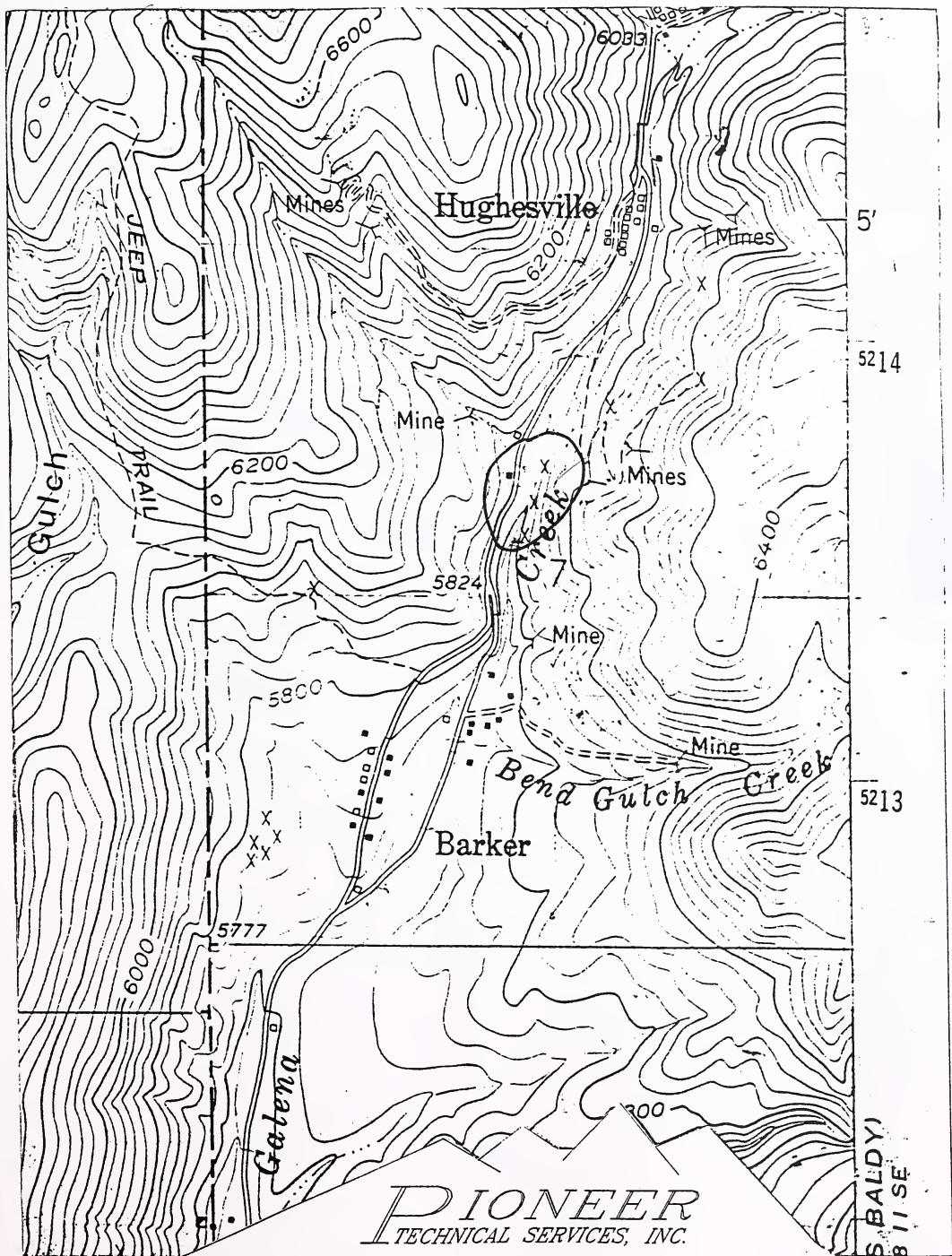
05/12/1993

Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:





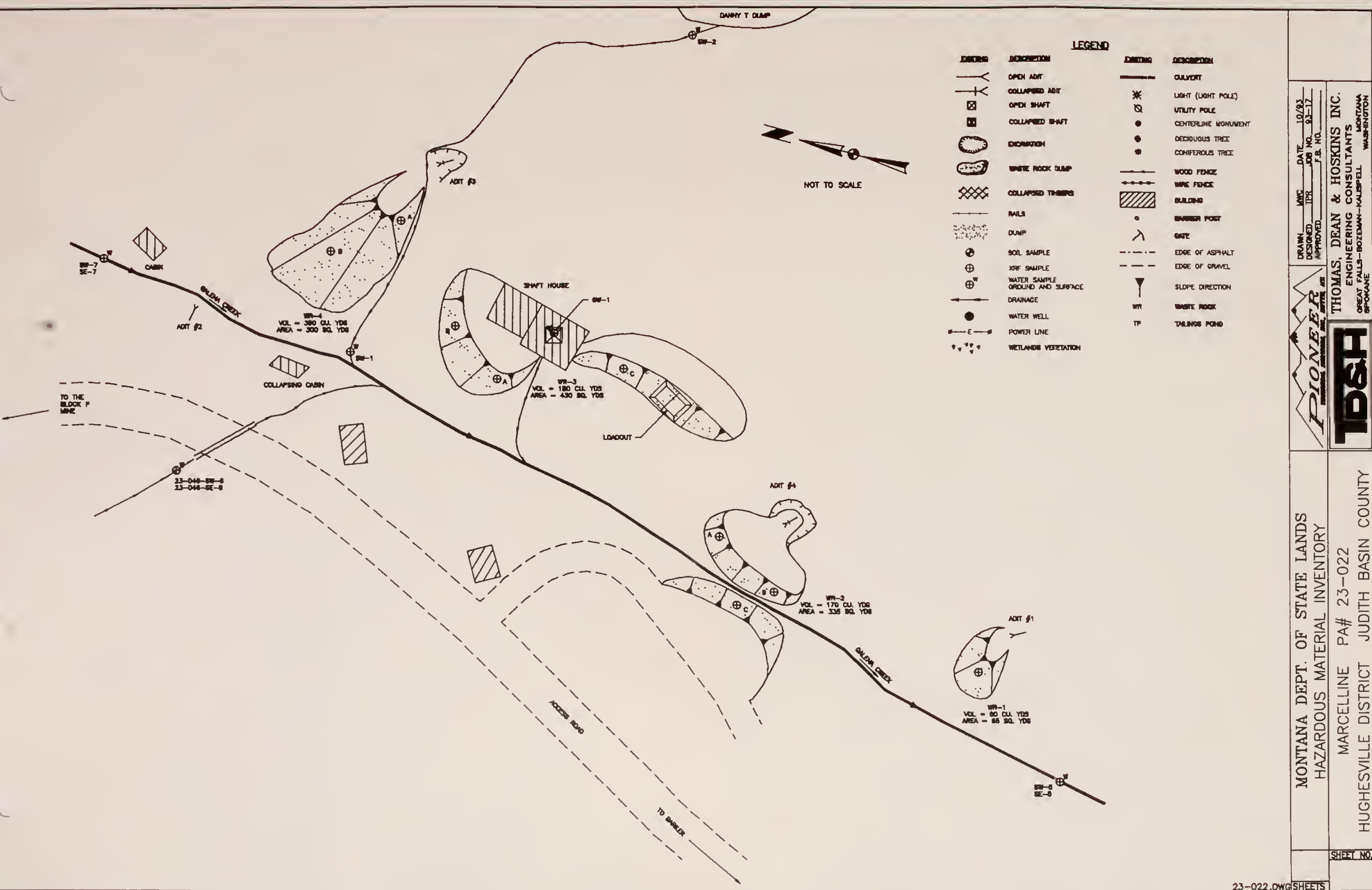
**PIONEER**  
TECHNICAL SERVICES, INC.

MARCELLINE, P.A. NO. 23-022

T15N, R09E, SECTION 07

SCALE: 1" = 1000'





MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
MARCELLINE PA# 23-022  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

SHEET NO.

DRAWN: MWC DATE: 10/83  
DESIGNED: JPR JOB NO.: 83-17  
APPROVED: J.B. NO.  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





# SOURCE INVENTORY FORM

SAMPLERS: Flamman, Bullock

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd')	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)	RADIO-ACTIVITY (MR/HR)	IAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	60	Small dump associated with Adit #1	None	6.2 (D)	0.05	N/A	N/A	XRF Analysis
WR-2A	WR	170	Dump for Adit #4-west side of creek	None	3.9 (D)	0.04	23-022-WR-2	06/04/93 1310	T Metals, ABA
WR-2B	WR		Dump for Adit #4-west side of creek	None	5.8 (D)	0.04			
WR-2C	WR		Adit #4 dump-east of creek	None	6.0 (D)	0.05			
WR-3A	WR	180	Dump with Shaft #1	None	6.0 (D)	0.04			
WR-3B	WR		Dump with Shaft #1	None	5.2 (D)	0.04			
WR-3C	WR		Shaft load out fill	None	< 3.5 (D)	0.04			
WR-4A	WR	390	Dump with Adit #3	None	6.0 (D)	0.05	23-022-WR-4	06/04/93 1330	T Metals, ABA
WR-4B	WR		Dump with Adit #3	None	< 3.5 (D)	0.04			

D-Direct reading (alloy Metal); S-Security Parts (Other Metal)

Comments or deviations from SOPs: 23-022-WR-2 is composite of WR-2A through -2C and WR-3A through -3C. 23-022-WR-4 is composite from WR-4A and -4B.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes X, No\_\_\_, Number: 1 Identification: Shaft #1

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 5 miles?: Yes X, No\_\_\_;

Number of well logs: 21

Distance to nearest well used for drinking? 0.5 mile in Barker

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite X, Probable\_\_\_, Possible\_\_\_, Unlikely\_\_\_.

Shaft water pH is 2.5.

Other observations/notes: Groundwater quality may be strongly influenced by the Danny T and Liberty mines upslope from the Marcelline.

**SAMPLERS:** Bullock, Flammang

FROM: Estimated (E) or Measured (M) from add, subtract, multiply or divide?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Galena Creek, unnamed tributary flowing down the east side from the Danny T Adit, and unnamed tributary from the west partially originating near the Wright and Edwards Lodes.

Dry streambeds: Yes     , No X, Name(s):                     

Other surface water: Yes     , No X, Name(s)/Description:                     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-2, WR-3, and WR-4

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)?                     

High Flow: 25, Average Flow: 2.5

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     , Describe: Danny T drainage flows through WR-4; Galena Creek bisects WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Irrigation, stock watering, recreation, wetlands, and fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? > 1 mi Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Entire Galena Creek drainage is severely impacted.



# SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Flammang

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH	SC $\mu S/cm @ 25^{\circ}C$	Sh mV	Temp $^{\circ}C$	ALK. mg/L as $CaCO_3$	Flow cfs/gpm	IAB. SAMPLER NO.	DATE/TIME	ANALYSES
SW-1	SW	Danny T drainage at confluence with Galena Creek	2.75	2520	596	7.8	3	20 gpm (E)	23-022-SW-1	06/04/93 1215	T-Metals, TDS, Hardness, $SO_4$ , $Cl^-$ , $NO_2/NO_3$
SW-2	SW	Danny T drainage as it enters Marcelline property at toe of Danny T dump	2.73	2530	569	6.7	8	20 gpm (E)	23-022-SW-2	06/04/93 1240	T-Metals, TDS, Hardness, $SO_4$ , $Cl^-$ , $NO_2/NO_3$
SW-5	SW	Galena Creek downgradient of Marcelline	4.54	500	615	5.5	8	2.42 cfs (M)	07-090-SW-5	06/07/93 1045	T-Metals, TDS, Hardness, $SO_4$ , $Cl^-$ , $NO_2/NO_3$
SE-5	SE	Galena Creek downgradient of Marcelline	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-5	06/07/93 1045	T-Metals
SW-6	SW	Western tributary from Wright/Rehards at confluence with Galena Creek	7.15	190	405	5.2	30	0.73 cfs (M)	23-046-SW-6	06/07/93 1045	T-Metals, TDS, Hardness, $SO_4$ , $Cl^-$ , $NO_2/NO_3$
SE-6	SW	Western tributary from Wright/Rehards at confluence with Galena Creek	N/A	N/A	N/A	N/A	N/A	N/A	23-046-SE-6	06/07/93 1045	T-Metals
SW-7	SW	Galena Creek upgradient of Marcelline	4.87	580	116	5.2	8	2.25 cfs (M)	07-090-SW-7	06/07/93 1105	T-Metals, TDS, Hardness, $SO_4$ , $Cl^-$ , $NO_2/NO_3$
SE-7	SE	Galena Creek upgradient of Marcelline	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-7	06/07/93 1105	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): 07-090-SW-5/SE-5, 07-090-SW-7/SE-7, and 23-046-SW-6/SE-6 samples were collected as part of a comprehensive high flow sampling conducted on 06/07/93. These samples are directly applicable to the Marcelline site.

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 1.5 acres across the stream - west side at higher elevation than stream - poor location

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe: All intrusive rock

### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 1/4 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Flammang

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_; 10-30 X; 30-100\_\_\_; 100-300\_\_\_;  
300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or greater\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes X, No\_\_\_, Describe: Litter  
present on-site \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted  
\_\_\_\_\_

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes X, No\_\_\_, Comment Possible \_\_\_\_\_

Primary Drainage\_\_\_; Secondary Drainage X; No Information\_\_\_:

Riparian Habitat Quality - High\_\_\_, Medium X, Low\_\_\_  
Wetlands Frontage - High\_\_\_, Medium\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_, Number 3, types and locations:\_\_\_  
Adits # 1 and #4; partially open shaft  
\_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_, Number 4, types and locations:\_\_\_  
Shaft house and cabins  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_, No X, Number\_\_\_,  
types and locations: \_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_,  
Number 1, types and locations: WR-4 is at angle of repose.  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_, No X, Explain: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB, Environmental Assessment Analytical Data, Prepared by MSE, Inc., October 4 and 29, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Marcelline, Prepared by Chen-Northern, August 30, 1987.

MDSL/AMRB Files, Abandoned Mine Reclamation Portal Inventory Form for Marcelline, Prepared by Daphne Digrindakis, October 16, 1985.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.



**LABORATORY ANALYTICAL DATA**

**MARCELLINE  
PA NO. 23-022**



Marcelline PA# 23-022  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/04/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-022-WR-2	122	208 J	1.5 J	2.07 J	1.41 J	31.1	23600	0.464	62.2	3.93	938	3.98 U	125	NR
23-022-WR-4	334	245 J	14.4 J	1.55 J	2.18 J	196	29700	0.87	145	2.76	12000	10 J	2170	NR
07-090-SE-5	368	213	0.7 U	6.7 J	4.7	146 J	56400	0.214 J	975 J	9 J	1410	5 U	566 J	NR
23-046-SE-6	379	220	2.3 J	11.9 J	7.3	139 J	66400	0.275 J	1800 J	11 J	4040	5 U	562 J	NR
07-090-SE-7	154	59	0.8 J	3.6 J	3.7	106 J	25200	0.177 J	438 J	3 J	584	4 U	152 J	NR
BACKGROUND	122 J	441 J	5.0	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Reported

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL ACID BASE v1000t	NEUTRAL POTENT. v1000t	SULFUR ACID BASE POTENT. v1000t	SULFATE %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE POTENT. v1000t	SULFUR ACID BASE POTENT. v1000t
23-022-WR-2	1.75	54.7	-0.8	-56	1.71	< 0.01	0.04	0	-0.83
23-022-WR-4	1.09	34.1	-4.4	-38	0.94	0.03	0.12	0.94	-5.3

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	CALC.
23-022-GW-1	15.1	2.24 U	365	106	5 U	277	51000	0.066 J	183000	981	502	100	79500	781
23-022-GW-2	14.7	2.24 U	369	111	5 U	264	52600	0.051 J	186000	989	539	96	81000	791
23-022-SW-1	1600	2.24 U	512	98.2	14.8	2730	248000	0.1 J	183000	969	137	126	108000	471
23-022-SW-2	1840	5.43	513	86.7	13.3	2950	291000	0.079 J	184000	965	216	125	108000	487
07-090-SW-5	38.7	23	34.4	8.73	5 U	256	12600	0.038 U	8940	45.9	59.6	50	7980	135
23-046-SW-6	13.9	20.6	13.2	5.99 U	5 U	57.8	5150	0.087	869	10.9	14.5	18.3 U	2130	76.9
07-090-SW-7	33	23.7	34.7	6.77	5 U	265	12300	0.038 U	8090	39.4	68.6	50.8	7790	142

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-022-GW-1	2220	< 5.0	1370	0.1	NR
23-022-GW-2	2190	< 5.0	1380	< 0.05	NR
23-022-SW-1	2700	< 5.0	1610	< 0.05	NR
23-022-SW-2	2800	< 5.0	1620	< 0.05	NR
07-090-SW-5	308	< 5.0	182	0.06	NR
23-046-SW-6	141	< 5.0	60	< 0.05	NR
07-090-SW-7	320	< 5.0	185	0.07	NR

WR2 - Composite of subsamples WR2A, 2B, 2C, 3A, 3B, and 3C.

WR4 - Composite of subsamples WR4A and 4B.

BACKGROUND - From the Bon Ton Mine (07-094-SS-1).

07-090-SE5 - Galea Creek downstream from the site

23-046-SE6 - Unnamed Trib. from Wright/Edwards at confluence with Galea Cr.

07-090-SE7 - Galea Creek upstream from the site.

GW1 - From the Marcelline Shaft.

GW2 - Duplicate of 23-022-GW-1.

SW1 - Eastern Tributary drainage @ confluence with Galea Creek.

SW2 - Eastern tributary drainage as it enters Marcelline property @ toe of the upgradient mine dump.

07-090-SW5 - Same as 07-090-SE5

23-046-SW5 - Same as 23-046-SE5

07-090-SW7 - Same as 07-090-SE7





**XRF ANALYSIS RESULTS**

**MARCELLINE  
PA NO. 23-022**



Mine Name: Marcelline PA# 23-022  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHf	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-022-WR1-A		21580.9	4414.54	2262.34		396.655 *	32936.5		221.532 *	282.567	85.3859 *	470.485
23-022-WR2-A		29572.5	3550.12	1647.91			19406.8			336.441		398.426
23-022-WR2-B		23413.9	3457.42	2690.81			23705.6			770.441		727.819
23-022-WR2-C		17705.3	2412.35	2129.33			19382.9		101.625 *	551.281		496.793
23-022-WR3-A		19413.1	2777.62	1307.44			26182.2			188.465		440.502
23-022-WR3-B		19974.3	4876.98	2187.36		425.14 *	44483.4			703.501		632.215
23-022-WR3-C		16230.1	2176.85	927.338		667.451 *	51494			868.612	917.183	373.334
23-022-WR4-A		19973.3	6780.32	2952.13			36201.3		101.948 *	232.284	113.03 *	622.549
23-022-WR4-B		24792.9	9317.29	1541.81			29879			120.713 *	135.325 *	463.135
23-022-WR-2-COMP		22048.4	3681.12	1864.85		661.229 *	29707.4	356.083 *	91.7143 *	1027.15	117.976 *	471.736
23-022-WR-4-COMP		21183.6	10137.4	2443.4			28927.9			173.616 *		673.614
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-022-WR1-A	319.81			314.075	218.934			1117.88		54.3321 *	40.939	
23-022-WR2-A	194.374			5637.24	239.684		72.3626 *	709.932	174.685 *		56.7675 *	
23-022-WR2-B	267.62			1336.21	227.3			1620.25	82.9985 *	22.7201 *	19.3899 *	
23-022-WR2-C	169.732			3028.67	172.777			1038.14	98.283 *		30.4233 *	
23-022-WR3-A	182.636			4037.11	202.771			1124.94	115.804 *		29.7891 *	
23-022-WR3-B	204.098			1867.62	224.401		35.9134 *	1548.61		18.1311 *	27.5006 *	
23-022-WR3-C	199.849			2512.94	159.909			3076.59	75.5323 *	21.9321 *	26.5945 *	
23-022-WR4-A	236.161			1022.21	162.045			1211.94	51.4057 *	34.1433 *	25.2403 *	
23-022-WR4-B	190.792			233.342	243.084			1079.89		35.493 *	20.2268 *	
23-022-WR-2-COMP	212.76			3254.3	199.723			1523.92	121.129 *	24.8258 *	37.2757 *	
23-022-WR-4-COMP	232.593			484.814	199.862			1664.28	87.3902 *	23.3128 *	31.9888 *	

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MARCELLINE  
PA NO. 23-022





# **AIMSS SCORESHEET**

SITE NAME:

MARCELLINE

PA NUMBER:

23-022

LINE NO.			PA NUMBER:	23-022
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.725
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		20
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	27.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	40975
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.092
16		DRINKING WATER POP'N		0
17	SW - TARGETS	IMPACTED DRAINAGE		5
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	36010
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.136
29		POPULATION - 4 MILES		10
30	AIR - TARGETS	NEAREST RESIDENCE		5
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	15
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	204
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.124
40	DIRECT CONTACT	POPULATION - 1 MILE		10
41	TARGETS	NEAREST RESIDENCE		5
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	17
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	527
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			0.78

SITE NAME: MARCELLINE  
 PA NUMBER: 23-022

LINE  
 NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	750
5		HAZ. STRUCTURES	40 EA.	160
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	1110
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	17
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>377.40</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

HUGHESVILLE MINING DISTRICT WATER QUALITY FIELD PARAMETERS

SITE NAME: BLOCK P TAILINGS POND  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celcius)	COMMENTS
BOX CULVERT (UPPER POND)	0.6	7.66	361	19.2	FLOW DUMPS DOWN ON TO LOWER POND

SITE NAME: NE, 22, SEC. 7 WORKINGS  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celcius)	COMMENTS
SHAFT	3-4	5.78	311	7.0	SAMPLE COLLECTED, FLOW SEEPS INTO DUMP
SEEP (BLW DUMP)	1	4.32	360	14.2	SAMPLE COLLECTED, FLOWS INTO GALENA CK

SITE NAME: MARCELLINE MINE  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC CONDUCTANCE (umhos/cm)	TEMP. (celcius)	COMMENTS
SHAFT	5	2.98	1310	7.1	
ADIT #3	3	2.80	1800	13.2	MAJORITY OF FLOW IS FROM THE JIMMY T ADIT
JIMMY T ADIT	6	2.88	790	6.1	RECENT DEVEL. PRESENT, FLOWS DWN THRU MARCEL
JIMMY T ADIT (TRTNNT BLDING)	6	2.87	1340	9.2	DWN STRM OF SMALL FLOCK TREATMENT BUILDING
JIMMY T ADIT (BLW DUMP)	6	2.79	1780	12.1	SAMPLE COLLECTED
GALENA CK (UPGRADIENT)	75-100	5.50	449	16.0	SAMPLE COLLECTED
GALENA CK (DWNGRADIENT)	100	4.27	449	16.2	SAMPLE COLLECTED

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Marcelline Upstream Galena Creek

LAB NO: W8569

DATE RECEIVED: 09-14-90

Hardness 217 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.021 mg/L

Cd 0.0354 mg/L

Cu 0.20 mg/L

Fe 17.8 mg/L

Pb 0.040 mg/L

Zn 11.2 mg/L

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: Marcelline Downstream Galena Creek

LAB NO: W8570

DATE RECEIVED: 09-14-90

Hardness 197 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.026 mg/L

Cd 0.0421 mg/L

Cu 0.23 mg/L

Fe 18.2 mg/L

Pb 0.054 mg/L

Zn 12.9 mg/L

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: <sup>Danny</sup> Jimmy T Dump Discharge

LAB NO: W8573

DATE RECEIVED: 09-14-90

Hardness 611 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.462 mg/L

Cd 0.262 mg/L

Cu 1.44 mg/L

Fe 307 mg/L

Pb 0.099 mg/L

Zn 78.8 mg/L

*Upgradient  
March 1990*



DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Marcelline #2 Topsoil Beneath #4 Adit Dump--08/16/90  
(Supporting grass 2' above stream 5" dump cover)

LAB NO: S2702

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.96 SU

Total Metals

As 1140 mg/Kg

Cd 1 mg/Kg

Cu 83 mg/Kg

Fe 102,000 mg/Kg

Pb 1030 mg/Kg

Zn 251 mg/Kg

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Marcelline Adit #4 Dump--08/16/90

LAB NO: S2706

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.89 SU

Total Metals

As 208 mg/Kg

Cd <1 mg/Kg

Cu 93 mg/Kg

Fe 25,000 mg/Kg

Pb 5700 mg/Kg

Zn 321 mg/Kg

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Marcelline #1 Topsoil Beneath #4 Adit Dump--08/16/90

LAB NO: S2703

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.80 SU

Total Metals

As 592 mg/Kg

Cd 1 mg/Kg

Cu 59 mg/Kg

Fe 64,500 mg/Kg

Pb 2000 mg/Kg

Zn 204 mg/Kg



23-022, #2: SW-1 sample location



23-022, #4: WR-2



23-022, #1: GW-1 and GW-2 sample location



23-022, #3: SW-2 sample location





23-022, #6: WR-3



23-022, #5: WR-3 and Shaft #1; GW-1 sample location

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: BELT PATENT PA#: 23-035

Date: June 4, 1993 Time: 0915-1315

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Overcast; cool; cool, wet  
spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #32: WR-1; #33, #34:  
TP-1 along Galena Creek. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):  
Site has one caved adit with small dump. Tailings from another  
source surround the waste rock. Galena Creek runs adjacent and  
through tailings entering with abundant FEOX staining and exiting  
the site with a red/orange color.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate the  
tailings base from Galena Creek; revegetate tailings and waste  
rock.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BELT PATENT PA#: 23-035

Legal Description: T 15N ; R 9E ; Sec. 7 , NW 1/4 NE 1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 04' 47" Longitude: W 110° 38' 00"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Della  
Antonioli, Emerald Resources, 1405 Steele, Butte, MT 59701. (406)  
723-8730; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district: Block P  
mine located right above this site.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is currently  
listed under the CECRA Program.

General site features: Elevation 5860' , Slope 15° ,  
Aspect West

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 1 acres.  
Dimensions:     

Predominant vegetation types: Lodgepole pine, shrubs, grasses

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MEMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on the east side of perennial  
Galena Creek, which flows south through the site. Galena Creek  
meets Dry Fork Belt Creek approx. 2 miles south.

Mining/milling history, ore type/tenor, host rock, gangue: Ore  
deposits are lenses in Barker porphyry along a contact between  
porphyritic syenite and porphyritic granite. Gangue is quartz and  
calcite. Minerals are galena, colvellite, polybasite,  
tetrahedrite, and quartz.

#### Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Caved  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A; Source of tailings is unknown.

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A

Montana Bureau of Mines and Geology  
Water Well Log Data

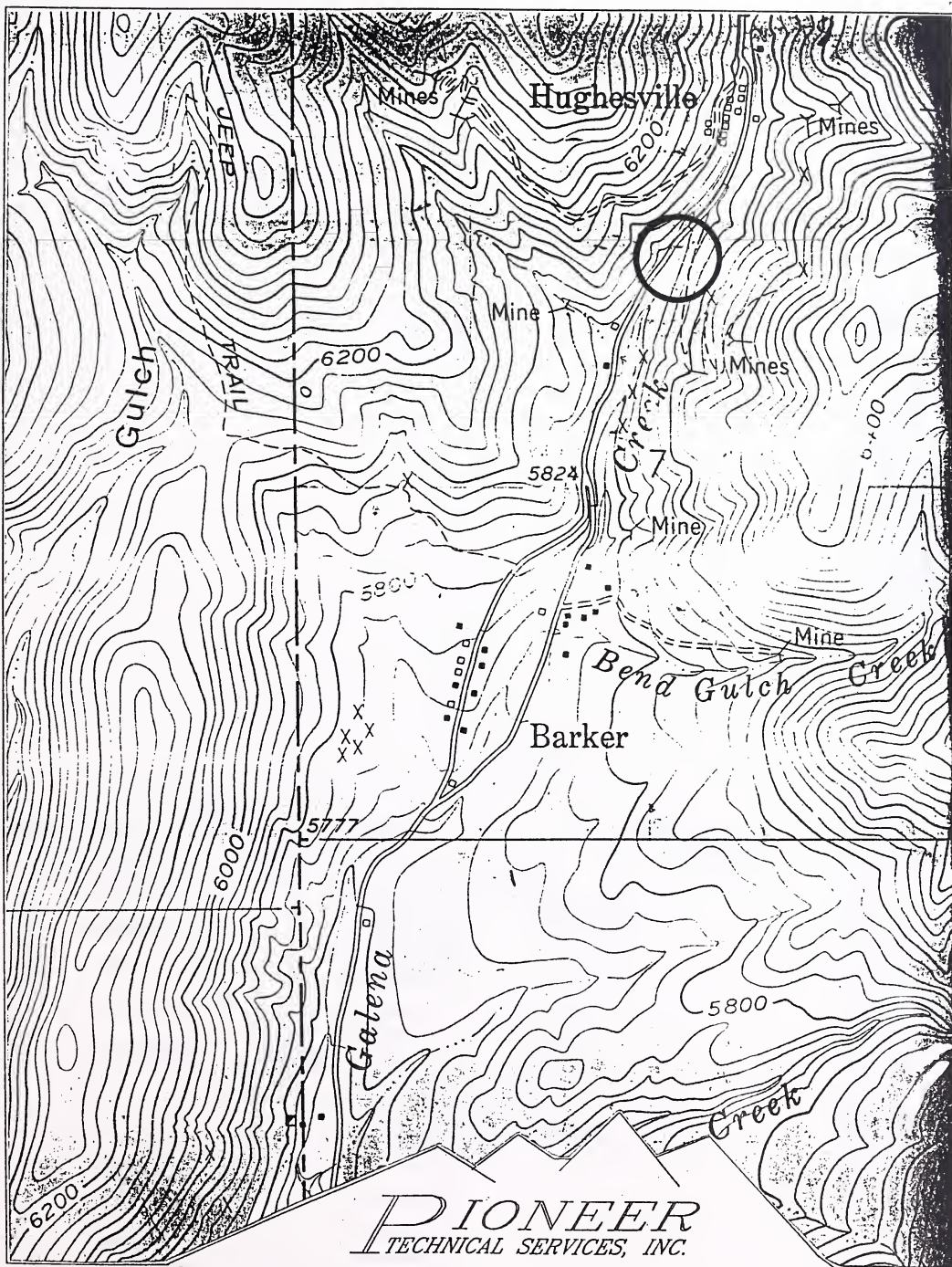
05/12/1993

Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB ←  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:





**PIONEER**  
TECHNICAL SERVICES, INC.

BELT PATENT, P.A. NO. 23-035

T15N, R09E, SECTION 07

SCALE: 1" = 1000'



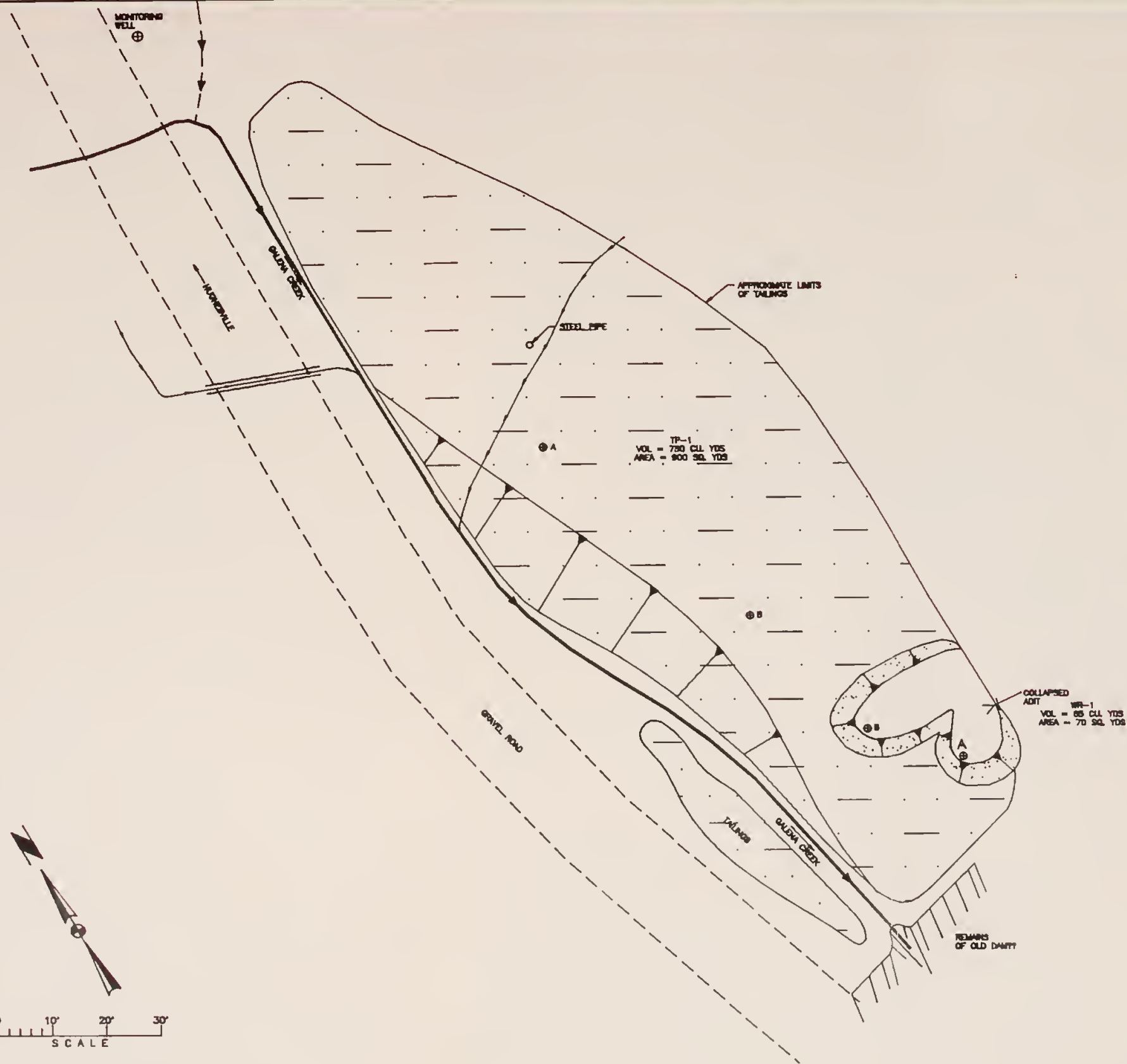


EXISTING	DESCRIPTION
	OPEN ADIT
	COLLAPSED ADIT
	OPEN SHAFT
	COLLAPSED SHAFT
	EXCAVATION
	WASTE ROCK DUMP
	COLLAPSED TIMBERS
	PILES
	DUMP
	XRF SAMPLE
	WATER SAMPLE GROUND AND SURFACE DRAINAGE
	WATER WELL
	POWER LINE
	WETLANDS VEGETATION

# LEGEND

EXISTING	DESCRIPTION
	CULVERT
	LIGHT (LIGHT POLE)
	UTILITY POLE
	CENTERLINE MONUMENT
	DECIDUOUS TREE
	CONIFEROUS TREE
	WOOD FENCE
	WIRE FENCE
	BUILDING
	BANNER POST
	GATE
	EDGE OF ASPHALT
	EDGE OF GRAVEL
	SLOPE DIRECTION
	WASTE ROCK
	TAILINGS POND
	TAILINGS

0 10' 20' 30'  
SCALE



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

BELT PATENT PA# 23-035

HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

PIONEER  
ENGINEERING CONSULTANTS

TDSH

DRAWN: MWC DATE: 10/93  
DESIGNED: TDR JOB NO: 83-17  
APPROVED: F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON





## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Ranges from coarse sand with gravel to fine slimes.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Not consistently stratified.  
Looks as if fine black clay slimes are on bottom, followed by yellow/gray fine silt and sand, then yellow sandy gravel on top.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry;  
wet at 2 feet/bgs.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Dam has been breeched; tailings are moving to creek during storms.

Comments on potential for mitigation: Divert run-on, armor bank of Galena Creek and cover with gravel and revegetate.



**SAMPLERS:** Tuesday, Belanger

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 23-035-TP-1A is composite of TP-1A and TP-2A. 23-035-TP-1B is grab of TP-1B.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_

Groundwater wells within 5 miles?: Yes X, No\_\_\_;  
Number of well logs: 21

Distance to nearest well used for drinking? 0.8 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.

Groundwater in base of tailings with elevated metal values.

Other observations/notes: N/A

## SAMPLERS:

[illegible]

**FLOW:** Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):



### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Galena Creek is adjacent to the site.

Dry streambeds: Yes\_\_\_\_, No X, Name(s): \_\_\_\_\_

Other surface water: Yes , No X , Name(s)/Description:

Waste materials within any floodplain: Yes X, No      Source ID(s): TP-1 and WR-1

Approximate Flood frequency?  $\frac{X}{TP-1}$  1 yr,  $\frac{X}{WR-1}$  10 yr, \_\_\_\_ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 4 during investigation  
High Flow: 25 cfs , Average Flow: 2.5 cfs

Distance between waste source(s) and nearest surface water body (ft)?\_0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Drainage from hillside goes through tailings to creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Dry Fork Belt Creek has fishery, wetlands, and recreation

Observed erosional/sedimentation/stream turbidity problems? Yes\_\_\_\_\_,  
No\_\_\_\_\_, Distance downstream (ft)?\_\_\_\_\_ Describe/explain (Note streambank  
stability and condition of streambank vegetation and any manmade structures or channel changes present): \_\_\_\_\_  
Unknown what impact this site has on downstream; sediment problems  
all along Galena Creek.



# SURFACE WATER INVENTORY FORM

**SAMPLERS:** Bullock, Babits, Flammanq, Pierson

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Galena Creek was sampled all at once at the Block P mine (PA No. 07-090).

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 1 acre

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe:

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100 X;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 0.8 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none
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# ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Tuesday, Belanger

[illegible]

**Notes and Clarifications:** TP-1 abundant fines available; WR-1 mostly rocky, fines there.

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100 X; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments \_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted  
along Galena Creek Road.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment _____
Wilderness Area -	Yes____, No <u>X</u> , Comment _____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment _____
Bat Habitat -	Yes____, No <u>X</u> , Comment _____

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium____, Low <u>X</u>
Fisheries Habitat and Species Classification -	<u>6</u>
Sport Fishery Classification -	<u>6</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 1, types and locations: TP-1 actively eroding into Galena Creek.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB, Environmental Assessment Analytical Data, Prepared by MSE, Inc., October 29, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Belt Patent site, Prepared by Chen-Northern, September 1, 1989.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.





**LABORATORY ANALYTICAL DATA**

**BELT PATENT  
PA NO. 23-035**





Belt/Grace/Marcelline PA# 23-035  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/04/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
07-090-SE-7	154	59	0.8 J	3.6 J	3.7	106 J	25200	0.177 J	438 J	3 J	584	4 U	152 J	NR
07-090-SE-8	255	218	3 J	9 J	4.8	215 J	43700	0.161 J	2120 J	19 J	3390	5 U	749 J	NR
23-035-TP-1A	929	1100 J	33.9 J	1.26 U	1.47 J	384	31200	2.1	77.6	1.85 U	17100	33.5 J	5440	1,128 U
23-035-TP-1B	3520	894 J	50.4 J	1.39 J	0.97 U	250	76000	1.3	31	1.72 U	9570	17.4 J	7830	1,107 U
BACKGROUND	122 J	441 J	5.0	9.66	26.5 J	22.7 J	33300	0.070	11900	75	375	4.24 J	1570	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000	POTENT.	%	POTENT.	%	%	%	1/1000	%	POTENT.	1/1000
23-035-TP1A	1.91	59.7	-4.2	-63.	1.01	0.22	0.68	6.87	-11.1	23.7	-34	
23-035-TP1B	2.84	88.7	-10.	-99	0.4	0.76	1.68					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
07-090-SW-7	33	23.7	34.7	6.77	5 U	265	12300	0.038 U	8090	39.4	68.6	50.8	7790	142
07-090-SW-8	29	23.6	30.2	5.99 U	5 U	239	11800	0.038 U	7560	41.5	51.1	38.9	7090	137

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2--N	CYANIDE
07-090-SW-7	320 <	5.0	185	0.07	NR
07-090-SW-8	274 <	5.0	178	0.06	NR

LEGEND

SE7 - Downstream in Galea Creek.  
SE8 - Upstream in Galea Creek.  
TP1A - Composite of subsamples TP1A and 2A.  
TP1B - Sample of the TP1B subsample.  
BACKGROUND - From the Bon Ton Mine (07-094-SS-1).

SW7 - Same as sample SE7.  
SW8 - Same as sample SE8.



**XRF ANALYSIS RESULTS**

**BELT PATENT  
PA NO. 23-035**



XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-035-TP1-1A		18682.4	1899.55	1614.25			24365.5		137.611 *	1564.3		296.506
23-035-TP1-1B		23042.7	2432.28	1448.4			58543.4		222.8 *	9085.61	2229.83	491.432
23-035-TP1-2A		18009.2	1899.67	1163.87			49804.8		302.036 *	1146.07		313.141
23-035-TP1-2B		27856.5	1799.24	1763.27	207.288 *		1471.4.6		86.2804 *	1396.28		358.287
23-035-TP1-2C		31017.6	1730.32	1781.78		571.629 *	31094.3	384.883 *	1598.92	21596.3		314.456
23-035-TP1-A-COMP		21006.2	1875.88	1494.2		458.183 *	37462.6		327.489	3070.51		335.414
23-035-WR1-A		30636.6	4538.39	2516.12		2392.76	50185.8		86.7679 *	222.912	513.36	523.854
23-035-WR1-B		14949.8	2679.58	1967.67			39525.6		166.879 *	638.279	1403.97	264.558
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-035-TP1-1A	216.562		30.2162	8105.63	135.656	102.605 *	84.7081 *	4007.24	258.76	18.2444 *	38.4478 *	
23-035-TP1-1B	207.173		33.9278	9426.34	162.117	299.352 *	88.3028 *	4191.48	379.418		45.0233 *	
23-035-TP1-2A	204.37		35.4755	10553.3	152.173		131.52 *	4308.06				
23-035-TP1-2B	137.052		24.1718 *	14986.8	154.792		81.9465 *	5782.38	321.255		54.9589 *	
23-035-TP1-2C	124.608		11.5079 *	13254.7	159.4	219.545 *	108.252 *	4837.8	299.241		35.4641 *	
23-035-TP1-A-COMP	183.327		21.4313 *	9345.87	157.784	141.33 *	119.884 *	4718.48	417.949		66.9359 *	
23-035-WR1-A	264.598		21.0097 *	1159.8	229.145			1614.37	88.4441 *	29.2372 *	37.0454 *	
23-035-WR1-B	260.264			1445.9	158.06			1161.7	87.1863 *	34.3272 *	33.8939 *	

\* - Estimated Quantity

\$ - Unvalidated Data





ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

BELT PATENT  
PA NO. 23-035



# **AIMSS SCORESHEET**

SITE NAME:BELT PATENT MINE/TAILING  
PA NUMBER: 23-035

LINE NO.			PA NUMBER:	23-035
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.077
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		20
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	22.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9	81693
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.877
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	15
24		SURFACE WATER SCORE	LINES 14 x 15 x 23	59262
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		20
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.193
29		POPULATION - 4 MILES		30
30	AIR - TARGETS	NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	30
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34	579
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.176
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		30
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	30
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43	528
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE (LINES 10 + 24 + 35 + 44) / 100,000			1.42

LINE NO.	SITE SAFETY		
1	THREAT	ACCESSIBILITY	20
2		OPEN SHAFTS 100 EA.	0
3		OPEN ADITS 50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS 75 EA.	0
5		HAZ. STRUCTURES 40 EA.	0
6		EXPLOSIVES	0
7		HAZ. MATERIALS	0
8		HAZARDS SCORE SUM LINES 2 - 7	0
9		POPULATION - 1 MILE	30
10	TARGETS	NEAREST RESIDENCE	0
11		RECREATIONAL USE	0
12		TARGETS SCORE SUM LINES 9 - 11	30
13		SITE SAFETY SCORE (LINES 1 x 8 x 12) / 1,000	0.00

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

SITE NAME: BELT FAYENT  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
GALENA CK (UPGRADIENT)	75-100	5.58	429	14.1	UPGRAD BLOCK P SAMPLE SERVES AS UPGRAD BELT
GALENA CK (DOWNGRADIENT)	75-100	5.53	436	14.1	UPGRAD MARCELLINE SAMPLE SERVES AS DOWNGRAD CK

SITE NAME: BLOCK P MINE  
DATE: 17-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SETP (TRAM BUILDING)	1-2	9.45	1010	11.7	SOURCE MAY BE ACID BEHIND THE BUILDING
STREAM (WEST DRAINAGE)	11	4.12	79	10.1	
QUINN ADIT	6	6.49	375	7.9	
GALENA CK (UPGRADIENT) (CALCULATED)	1047	7.62	229	11.3	SAMPLE COLLECTED
GALENA CK (DOWNGRADIENT)	107	5.73	355	10.8	SAMPLE COLLECTED, LOCATED AT HUGHESVILLE RD C BELOW THE BLOCK P DUMP

SITE NAME: WRIGHT & EDWARDS MINES  
DATE: 17-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SETP (RAW ED'S DUMP)	1-2	2.53	1780	12.2	SETP & TUE OF EDWARD'S ADIT DUMP IN DRAINAGE
ACID STREAM	4	2.71	1090	11.0	
FRESH STREAM	9	6.90	147	12.1	ALKALINITY = 77 mg/l as CaCO3
COMBINED STREAM	13	6.68	152	12.5	
COMBINED STREAM (OLD DUMP)	14	6.00	170	14.2	ADIT & DUMP APPROX 200 YD ABOVE HUGHESVILLE R STREAM FLOWS INTO GALENA CK AT THE MARCELLINE

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: Belt Patent Tailings--08/16/90

LAB NO: S2707

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 3.08 SU

Total Metals

As 1060 mg/Kg

Cd <1 mg/Kg

Cu 446 mg/Kg

Fe 40.500 mg/Kg

Pb 18.800 mg/Kg

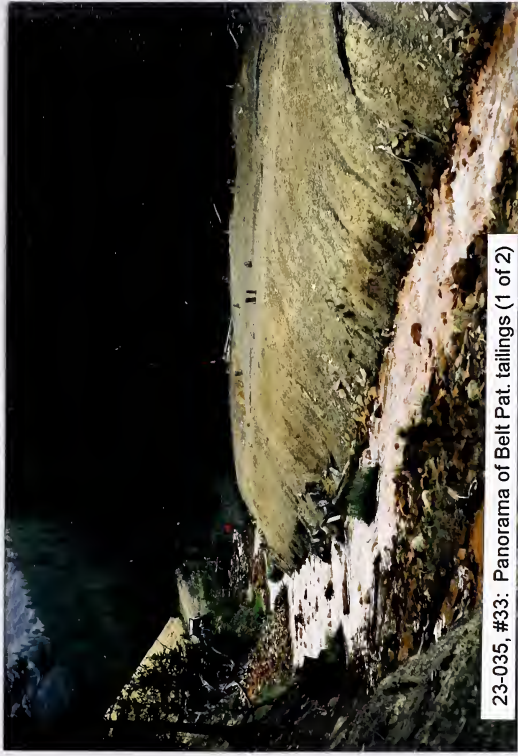
Zn 1520 mg/Kg



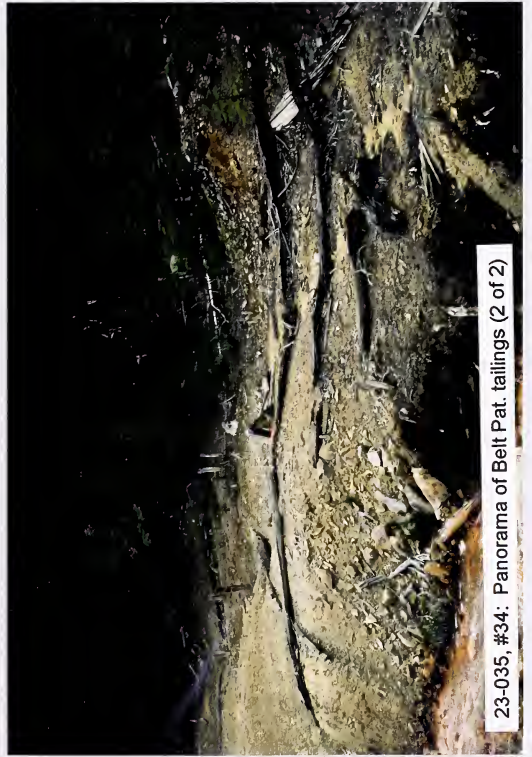




23-035, #32: WR-1



23-035, #33: Panorama of Belt Pat. tailings (1 of 2)



23-035, #34: Panorama of Belt Pat. tailings (2 of 2)



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: NE SE S7 PA#: 23-042

Date: June 4, 1993 Time: 1345-1730

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: Bullock, Flammang, Clark; Pioneer

Weather/Seasonality Observations: Cool; cloudy; cool, wet spring  
and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #35: SW-2,  
downstream sample location; #36: Adit discharge, SW-1 location;  
#37: Shaft and dump HMO. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms):   
Also may be called the "Lucky Strike" mine.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit  
discharge is fine until it flows through the dump; reroute  
discharge and dry drainage/spring around or over the dump. Move  
base of dumps out of drainages. Dumps contain high sulfides;  
revegetate with amendments.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): NE SE S7 PA#: 23-042

Legal Description: T 15N ; R 9E ; Sec. 7 , NE1/4 NE1/4 SW1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 04' 28" Longitude: W 110° 38' 00"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc

Activity Status: Active , Inactive/Exploration , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Lera Dell  
Logan, Box 843, Ralls, TX 79357; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district: The  
Marcelline mine is located upstream from this site.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is currently  
listed under the CECRA Program.

General site features: Elevation 5800' , Slope 23° ,  
Aspect Southwest; located on northeast edge of Barker town site.

Land use: Mining  , Recreational  , Residential X , Urban  ,  
Agricultural  , Other (Specify)

Area of disturbed/unvegetated lands? 0.5 acres.  
Dimensions: Approx. 200'x300'

Predominant vegetation types: Lodgepole pine, fir

Access: roads - good X , poor  , 4wd  , trail  .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on the north side of a small, unnamed tributary just above and on the confluence with Galena Creek. Site is located on the west side of Galena Creek, which flows southwest past the site to its confluence with Dry Fork Belt Creek 1 1/2 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: Ore deposits are lenses in Barker porphyry along a contact between porphyritic syenite and porphyritic granite. Gangue minerals are quartz and calcite. Minerals are galena, covellite, polybasite, tetrahedrite, and quartz.

#### Mine Operation?

Shafts - Yes X, No    , # 1, Comment HMO

Adits - Yes X, No    , # 1, Comment Caved with discharge

Pits - Yes    , No X, #    , Comment    

Placers - Yes    , No X, #    , Comment    

Other - Yes    , No X, #    , Comment    

Mill Operation? Yes    , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill     Dedicated Mill    ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A



Montana Bureau of Mines and Geology  
Water Well Log Data

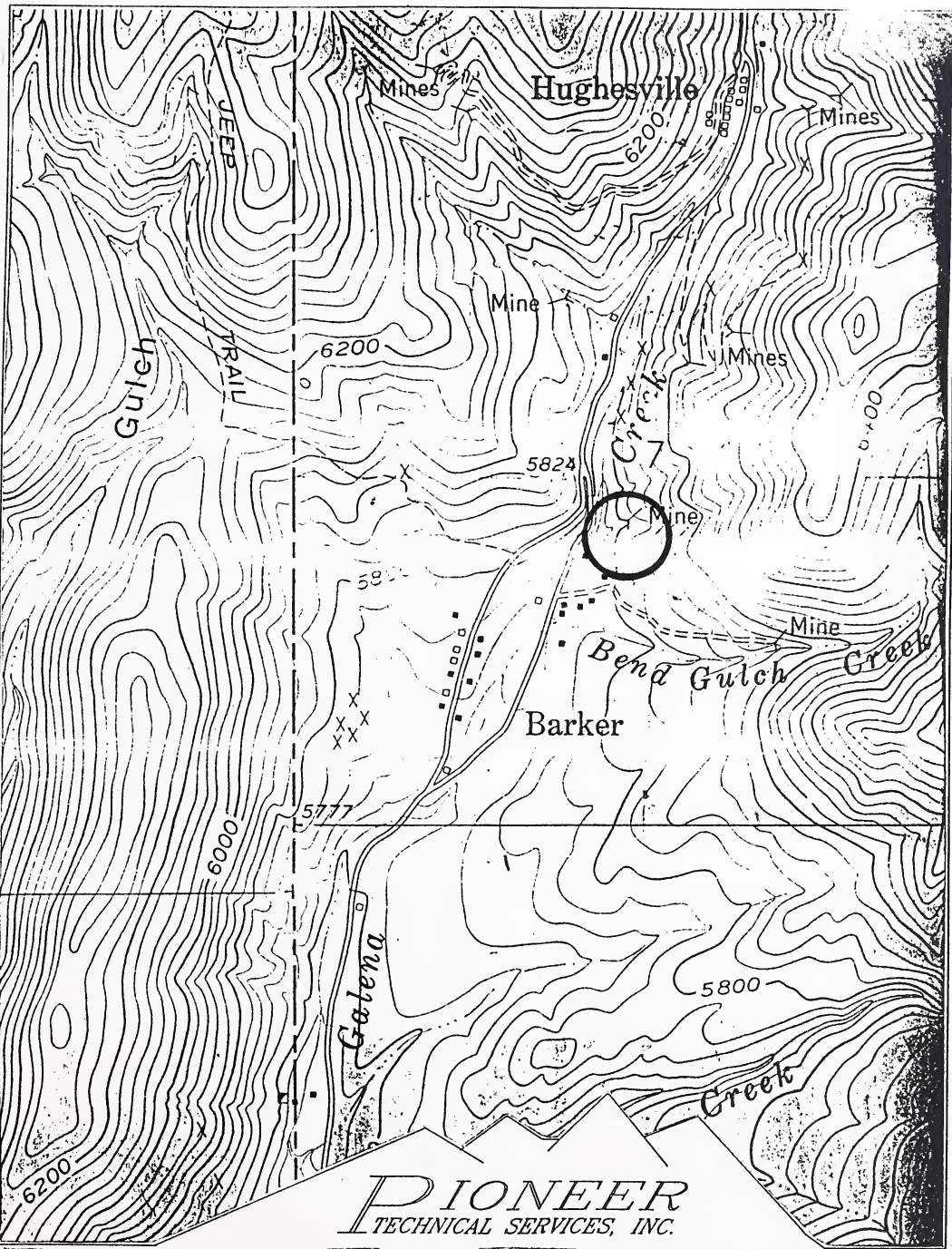
05/12/1993

Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0'  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:





**PIONEER**  
TECHNICAL SERVICES, INC.

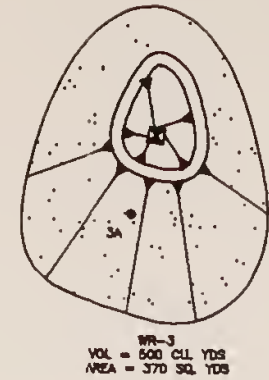
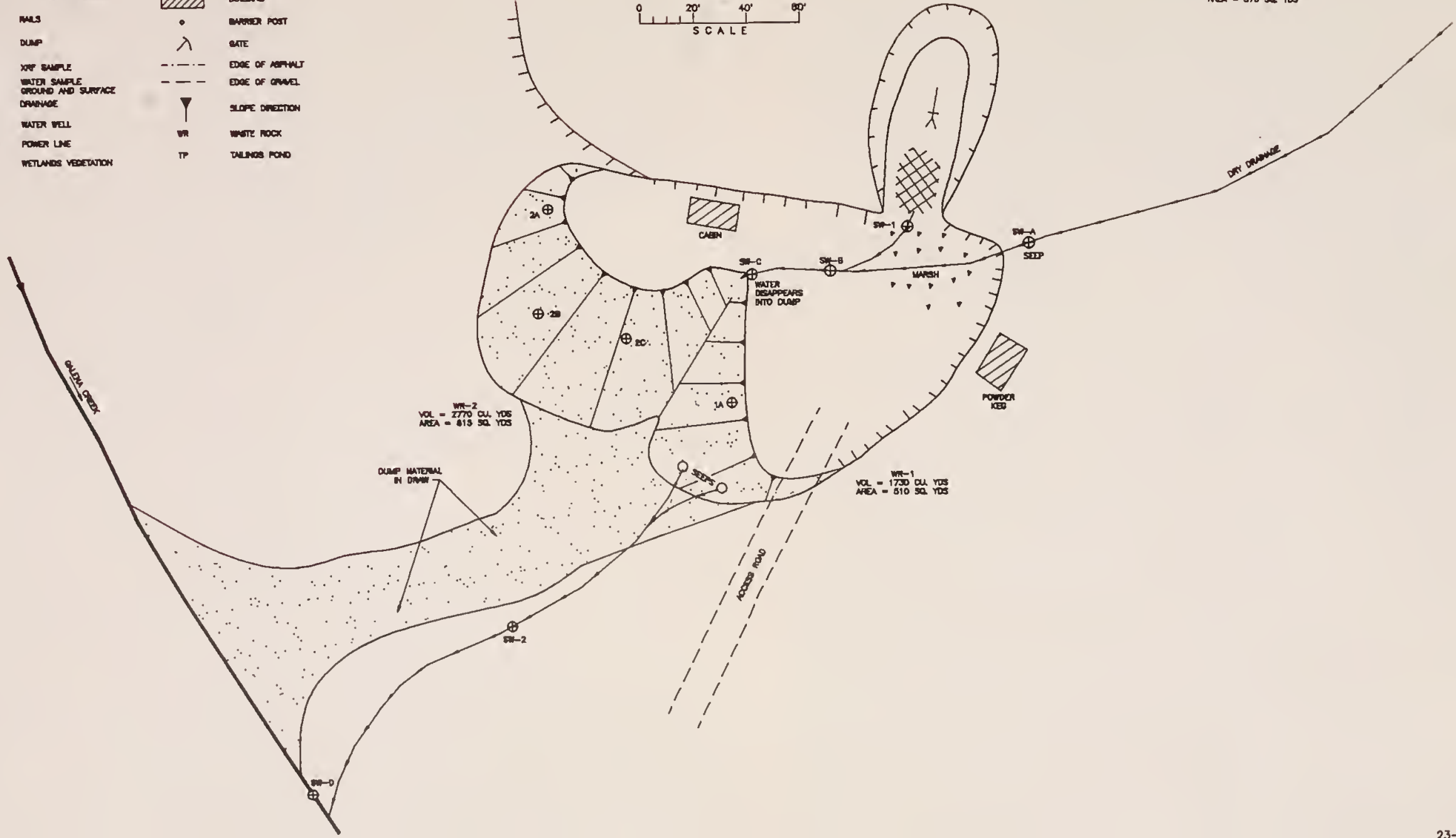
NE SE S07, P.A. NO. 23-042

T15N, R09E, SECTION 07

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WHITE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	XRF SAMPLE		BARRIER POST
	WATER SAMPLE GROUND AND SURFACE DRAINAGE		GATE
	WATER WELL		EDGE OF ASPHALT
	POWER LINE		EDGE OF GRAVEL
	WETLANDS VEGETATION		SLOPE DIRECTION
			WHITE ROCK
			TAILINGS POND



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
NE,SE, SEC. 7 PA# 23-042  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

**PIONEER**  
ENGINEERING CONSULTANTS  
THOMAS, DEAN & HOSKINS INC.  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN: JTP DATE: 23-JUNE-83  
DESIGNED: JTP JOB NO.: 83-17  
APPROVED: JTP F.B. NO.:  
SHEET NO. 23-042.DWG SHEETS



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





# SOURCE INVENTORY FORM

**SAMPLERS:** Tuesday, Belanger

[illegible]

\* D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 23-042-WR-1 is composite of WR-1, and WR-2A through -2C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Adit

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes X, No    , Number: 1 Identification: Seep in unnamed drainage adjacent to adit.

Groundwater wells within 5 miles?: Yes X, No    ;  
Number of well logs: 21

Distance to nearest well used for drinking? Barker (town) is 1/8 mile from site.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Waste rock dumps have some elevated metal values; shallow groundwater near floodplain.

Other observations/notes: N/A

**SAMPLERS:** Belanger

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No   , Name(s): Galena Creek

Dry streambeds: Yes   , No X, Name(s):   

Other surface water: Yes X, No   , Name(s)/Description: Adit discharge and unnamed tributary seepage

Waste materials within any floodplain: Yes   , No X Source ID(s):   

Approximate Flood frequency?    1 yr,    10 yr,    100 yr

Estimated seasonal flow of stream(s) (cfs)?    6 cfs in Galena Creek during the investigation

High Flow: 25 cfs, Galena Creek; 0.5 gpm, unnamed tributary,  
Average Flow: 2.5 cfs, Galena Creek; 0.02 gpm, unnamed tributary

Distance between waste source(s) and nearest surface water body (ft)?    0 feet; seepage flows over and through WR-1.

Surface water draining onto or through waste sources: Yes X, No   ,  
Describe: Discharge from adit (pH 6.9) combines with tributary seep (pH 8.0), flows over and into dump, emerges at base of WR-1 (pH 5.5) and flows into Galena Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Galena Creek flows into Dry Fork Belt Creek within 15 miles; Dry Fork Belt Creek has recreation, fishery, and wetlands.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No   , Distance downstream (ft)? N/A Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Galena Creek is severely impacted for its entire length (not much streambank vegetation and iron-staining).



# SURFACE WATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC $\mu\text{S}/\text{cm}$ @ 25°C	Eh mv	Temp °C	ALK. mg/L as $\text{CaCO}_3$	Flow* cfs/g pm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
A	SW	Unnamed tributary seepage	8.02	40	N/A	5.4	N/A	N/A	N/A	N/A	Field Parameters
B	SW	Adit combines with "A" above on top of dump	7.21	290	N/A	6.8	N/A	N/A	N/A	N/A	Field Parameters
C	SW	Prior to sinking into dump material	7.10	250	N/A	8.2	N/A	N/A	N/A	N/A	Field Parameters
D	SW	Combines with other drainage before entering Galena Creek	5.3	350	N/A	7.1	N/A	N/A	N/A	N/A	Field Parameters
SW-2	SW	Exit discharge from bottom of dump	5.54	350	393.4	9.3	0	0.02 cfs (E)	23-042-SW-2	06/07/93 1015	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SW-4	SW	Downgradient Galena Creek	6.2	410	372.3	6.4	1.0	6.025 cfs (H)	07-090-SW-4	06/07/93 1015	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-4	SE	Downgradient Galena Creek	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-4	06/07/93 1015	T-Metals
SW-5	SW	Upgradient Galena Creek	4.54	564	615	5.5	1.0	2.42 cfs (H)	07-090-SW-5	06/07/93 1045	T-Metals, TDS, Hardness, Cl, SO <sub>4</sub> , NO <sub>2</sub> /NO <sub>3</sub>
SE-5	SE	Upgradient Galena Creek	N/A	N/A	N/A	N/A	N/A	N/A	07-090-SE-5	06/07/93 1045	T-Metals

Flow: Estimated (E) or Measured (H)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? < 1 acre

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes , No X , Describe:

### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100 X;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 500 feet to the south

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



**SAMPLERS: Tuesday, Belanger**

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30 X; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_  
Bat Habitat - Yes\_\_\_\_, No X, Comment\_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Shaft (caved) above adit\_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Cabin on top of dump\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 2, types and locations: WR-1 and WR-2 steep and caving toward creek.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the NE SE Section 7/Lucky Strike site, Prepared by Chen-Northern, August 31, 1989.

MDSL/AMRB, Environmental Assessment Analytical Data, Prepared by MSE, Inc., October 4 and 29, 1990.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.



LABORATORY ANALYTICAL DATA

NE SE S7 (LUCKY STRIKE)  
PA NO. 23-042



NE SE Sec. 7 (Lucky Strike) PA# 23-042  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/04/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-090-SE-4	272	147	3.6 J	3.2 J	5.1	107 J	45900	0.097 J	651 J	6 J	1590	4 U	811 J	NR
07-090-SE-5	368	213	0.7 U	6.7 J	4.7	146 J	56400	0.214 J	975 J	9 J	1410	5 U	566 J	NR
23-042-WR-1	283	195 J	1.1 J	1.15 U	0.96 U	85.6	32400	0.458	180	2.75	971	3.5 UJ	135	NR
BACKGROUND	122 J	441 J	5	9.66	26.5 J	22.7 J	33300	0.071	11900	75	375	4.24 J	1570	NR

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	NEUTRAL SULFUR u/1000	ACID BASE POTENT. u/1000	SULFUR ACID BASE POTENT. u/1000	ORGANIC SULFUR %	PYRITIC SULFUR u/1000	PYRITIC SULFUR ACID BASE POTENT. u/1000	SULFUR ACID BASE POTENT. u/1000
23-042-WR1	0.63	19.7	-3.5	-23	0.06	< 0.01	0	-3.53

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC. (mg CaCO3/L)
23-042-SW-1	3.24	18	2.55 U	5.99 U	5 U	5.2	512	0.086 J	5220	37.8	2.53	18.3 U	403	164
23-042-SW-2	2.95	46.8	2.55 U	6.4	5 U	19.2	635	0.054 J	2730	23.6	2.91	18.3 U	208	59.3
07-090-SW-4	38.8	22.7	36.5	9.03	5 U	246	11600	0.038 U	8670	43.4	121	53.8	7750	131
07-090-SW-5	38.7	23	34.4	8.73	5 U	256	12600	0.038 U	8940	45.9	59.6	50	7980	135

U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-042-SW-1	279 <	5.0	177 <	0.05	NR
23-042-SW-2	115 <	5.0	70	0.05	NR
07-090-SW-4	318 <	5.0	181	0.05	NR
07-090-SW-5	308 <	5.0	182	0.06	NR

LEGEND

SE4 - Downgradient Galena Creek.  
SE5 - Upgradient Galena Creek.  
WR1 - Composite of subsamples WR1 and 2A through 2C.  
BACKGROUND - From Silver Dike Adit (07-135-SS-1).

SW1 - Adit discharge.  
SW2 - Discharge from bottom of dump.  
SW4 - Same as sample SE4.  
SW5 - Same as sample SE5.





XRF ANALYSIS RESULTS

NE SE S7 (LUCKY STRIKE)  
PA NO. 23-042



Mine Name: NE SE Section 7/Lucky Strike PA# 23-042

XRF Field Analyses

Results in PPM

XRF SAMPLE ID	CHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-042-WR1-A		20029	20003.5	3778.11		442.545 *	46947.5				175.812 *	653.201
23-042-WR2-A		40148	4136.49	2039.47		35283.7	35283.7		110.56 *	72.0871 *	344.924	290.533
23-042-WR2-B		31995.7	3239.62	3317.57		598.684 *	84180.1		176.428 *	318.964	820.352	447.29
23-042-WR2-C		38555.1	1986.91	1781.76		8250.27	8250.27			87.1946 *		188.44
23-042-WR3-A	438.492	25109.2	7708.2	3955.33		965.687 *	28079.3		70.4773 *	154.492 *	67.7804 *	768.432
23-042-WR-1-COMP		34920.4	5948.72	3074.68		395.417 *	38750.6		94.4891 *	104.052 *	279.704 *	356.399
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-042-WR1-A	273.727			130.401	188.577	191.374 *		2069.08	92.005 *	45.464 *	36.5553	
23-042-WR2-A	222.176		1219.57	619.858	406.597			1694.59	94.1102 *		43.0122 *	
23-042-WR2-B	249.618		144.447	554.285	302.09			2629.43	120.287 *	23.4669 *	26.8512 *	
23-042-WR2-C	188.795		81.3781	951.794	259.7			1273.9		39.3351 *	37.5309 *	
23-042-WR3-A	244.169		14.8231 *	347.205	191.504	106.839 *		2368.88		37.0412 *	43.1858	
23-042-WR-1-COMP	231.061		443.622	552.955	277.121			1742.98		25.0046 *	44.4716	

\* - Estimated Quantity

\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

NE SE S7 (LUCKY STRIKE)  
PA NO. 23-042





# **AIMSS SCORESHEET**

SITE NAME: NE SE S7 / LUCKY STRIKE  
PA NUMBER: 23-042

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.972
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		20
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	32.5
10		<b>GROUNDWATER SCORE</b>	LINES 4 x 5 x 9	38636
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.155
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	15
24		<b>SURFACE WATER SCORE</b>	LINES 14 x 15 x 23	18930
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.082
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		<b>AIR PATHWAY SCORE</b>	LINES 27 x 28 x 34	984
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	400
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.076
40	DIRECT CONTACT	POPULATION - 1 MILE		10
41	TARGETS	NEAREST RESIDENCE		10
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	20
44		<b>DIRECT CONTACT SCORE</b>	LINES 38 x 39 x 43	608
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			0.59
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE  
NO.

SITE NAME: NE SE S7 / LUCKY STRIKE  
PA NUMBER: 23-042

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	140
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	20
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>56.00</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

# HIGHSVILLE MINING DISTRICT WATER QUALITY FIELD PARAMETERS

SITE NAME: BLACK P TAILINGS POND  
DATE: 15-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
BOX CULVERT (CUPPER POND)	0.6	7.80	561	15.2	FLOW DUMPS DOWN ON TO LOWER POND

SITE NAME: NE, SE, SEC. 7 WORKINGS  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SHAFT	3-4	5.78	311	7.0	SAMPLE COLLECTED, FLOW SLEEPS INTO DUMP
SLEEP (BLW DUMP)	<1	4.32	360	14.2	SAMPLE COLLECTED, FLOWS INTO GALENA CK

SITE NAME: MARCELLINE MINE  
DATE: 16-Aug-90

STATION	FLOW (gpm)	pH (s.u.)	SPECIFIC		COMMENTS
			CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SHAFT	5	2.99	1310	7.1	
ADIT #3	3	2.80	1800	13.2	MAJORITY OF FLOW IS FROM THE JIMMY T ADIT
JIMMY T ADIT	6	2.88	750	6.1	RECENT DEVEL. PRESENT, FLOWS DOWN THRU MARCEL
JIMMY T ADIT (TERTIARY GROUND)	6	2.87	1340	8.2	DWN STRM OF SMALL FLUCK TREATMENT BUILDING
JIMMY T ADIT (BLW DUMP)	6	2.79	1780	12.1	SAMPLE COLLECTED
GALENA CK (UPGRADIENT)	75-100	5.50	449	16.0	SAMPLE COLLECTED
GALENA CK (DOWNGRAIENT)	100	4.27	449	16.2	SAMPLE COLLECTED

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: NE SE Section 7 Adit

LAB NO: W8565

DATE RECEIVED: 09-14-90

Hardness 167 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.024 mg/L

Cd <0.0001 mg/L

Cu 0.01 mg/L

Fe 201 mg/L

Pb 0.002 mg/L

Zn 0.56 mg/L

REPORT DATE: October 4, 1990

CLIENT: Abandon Mines

FIELD ID: NE SE Section 7 Dump Seep

LAB NO: W8566

DATE RECEIVED: 09-14-90

Hardness 197 mg/L as  $\text{CaCO}_3$

Total Extractable Metals

As 0.010 mg/L

Cd 0.0015 mg/L

Cu 0.05 mg/L

Fe 5.62 mg/L

Pb 0.003 mg/L

Zn 0.55 mg/L

DATE: October 29, 1990

CLIENT: Abandoned Mines

FIELD ID: NE-SE Section 7

LAB NO: S2710

DATE RECEIVED: 09-24-90

pH (1:1 slurry) 2.80 SU

Total Metals

As 19 mg/Kg

Cd <1 mg/Kg

Cu 3 mg/Kg

Fe 9340 mg/Kg

Pb 133 mg/Kg

Zn 13 mg/Kg







23-042, #36: Adit discharge; SW-1 sample location



23-042, #35: SW-2 sample location



23-042, #37: Shaft and dump (HMO)



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: WRIGHT LODGE PA#: 23-045

Date: June 7, 1993 Time: 1315

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Rain; cold (35°F); breeze;  
runoff is occurring from site.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: Adit #1; #14:  
WR-2; #15: WR-3; #16: SW-1 sample location at base of WR-4; #17:  
SW-2 sample location above Adit #3; #18: WR-4 lower part and  
drainages across it; #19: WR-4 upper part.  
Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):  
N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate  
drainage from waste material; grade, amend, and revegetate dump  
material. Difficult conditions due to large volume of waste  
material in a relatively steep and narrow drainage.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): WRIGHT LODGE PA#: 23-045

Legal Description: T 15N ; R 9E ; Sec. 7 , NW1/4 NW1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 05' 03" Longitude: W 110° 38' 23"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Lead, Silver, Zinc

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): Della  
Antonioli, Emerald Resources, 1405 Steele, Butte, MT 59701. (406)  
723-8730; Harry Anderson, 1900 E. Girard Place #307, Englewood, CO  
80010. (303) 789-9556; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district: Located  
just above Edwards mine; two adits connect the Wright/Edwards with  
Barker shaft.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is listed  
under CECRA.

General site features: Elevation 6300' , Slope 32° ,  
Aspect Southeast

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 4 acres.  
Dimensions:     

Predominant vegetation types: Lodgepole pine forest surrounding  
mine

Access: roads - good X , poor      , 4wd      , trail      .  
Other logistical considerations (proximity to other sites). Just  
above Edwards mine in the same drainage.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MEMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site is underlain by a vein in a well-defined persistent fissure in a mass of granular syenite which has intruded the Barker porphyry. The Wright Lode lies in an unnamed tributary to Galena Creek. Water flows southeast through the site and meets Galena Creek approx. 1/3 mile downstream to the southeast.

Mining/milling history, ore type/tenor, host rock, gangue: Wright claim was located in 1880 and patented in 1881. From 1892, properties operated as part of Block P Mining Co. An explosion in 1982 destroyed a shaft and it was never replaced. Sulfide minerals in vein are mainly galena, sphalerite, marmite, pyrite, tetrahedrite, and chalcopryrite. Gangue minerals are quartz, calcite, barite, rhodochrosite, and altered syenite or granite porphyry. Wright and Edwards were reported to have produced 700 to 800 tons of ore per month during 1890. Production up to 1892 was 2,700 tons of ore, averaging 42 oz. Ag and 48% Pb.

Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 4, Comment       
Pits - Yes X, No     , # Many, Comment       
Placers - Yes     , No     , #     , Comment       
Other - Yes X, No     , # Many, Comment Trenches

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



Montana Bureau of Mines and Geology  
Water Well Log Data

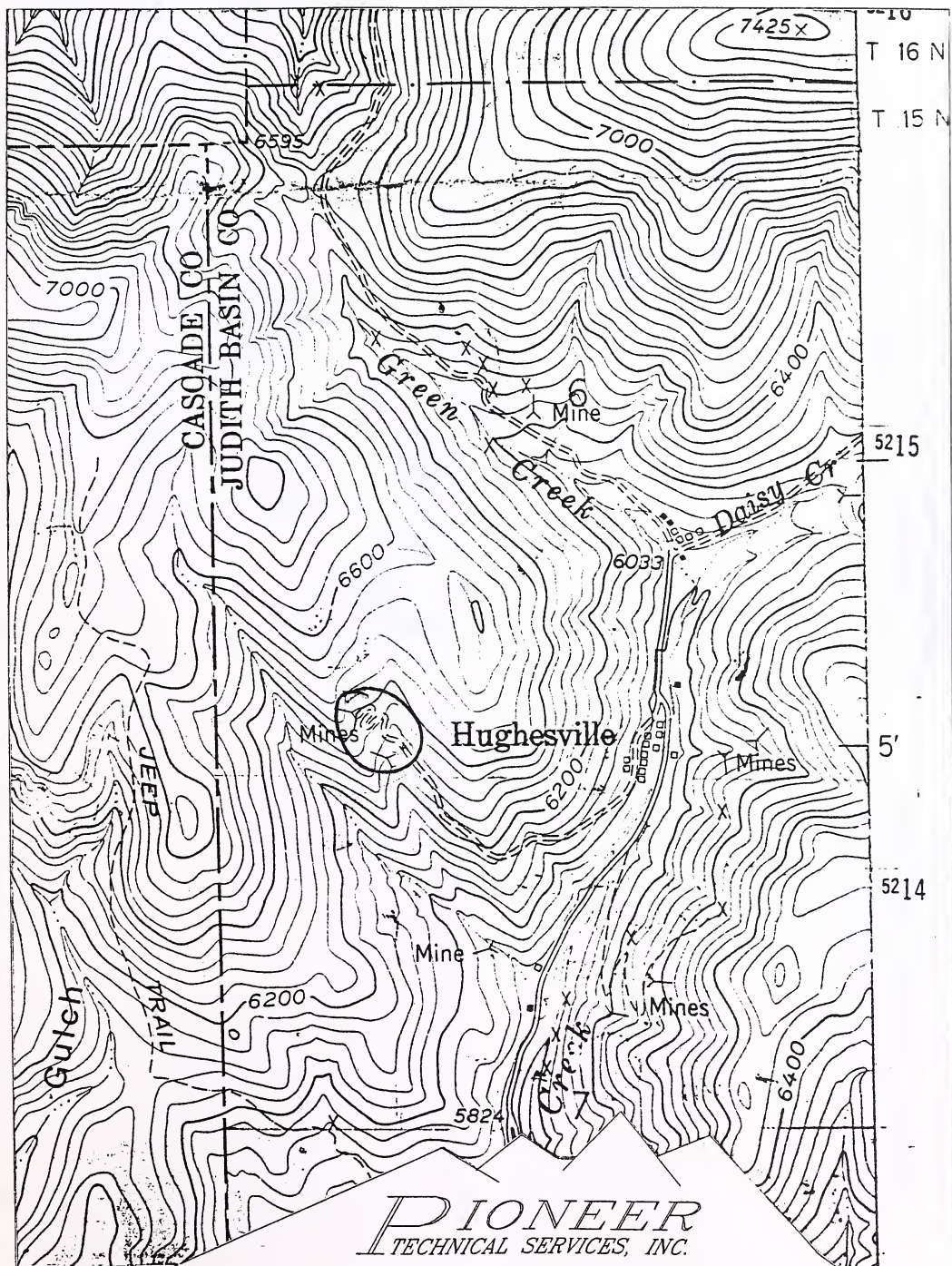
05/12/1993

Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:



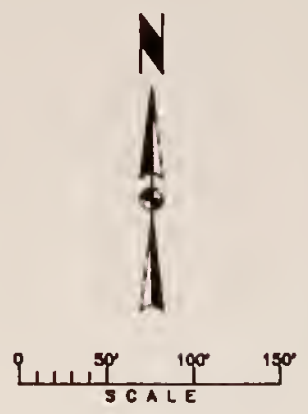
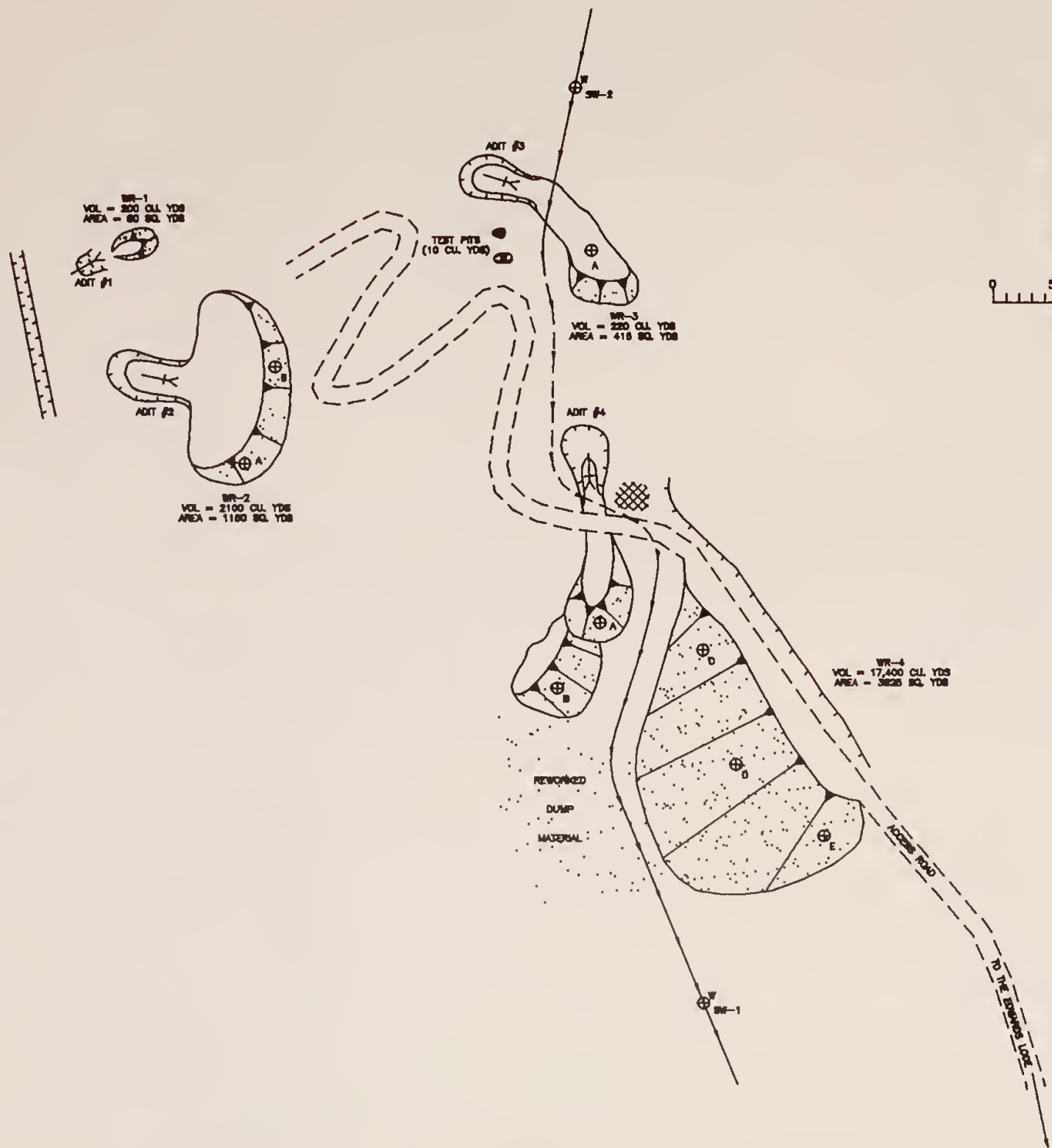


WRIGHT LODGE, P.A. NO. 23-045

T15N, R09E, SECTION 07

SCALE: 1" = 1000'





SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	OPEN ADIT		CULVERT
	COLLAPSED ADIT		LIGHT (LIGHT POLE)
	OPEN SHAFT		UTILITY POLE
	COLLAPSED SHAFT		CENTERLINE MONUMENT
	EXCAVATION		DECIDUOUS TREE
	WASTE ROCK DUMP		CONIFEROUS TREE
	COLLAPSED TIMBERS		WOOD FENCE
	RAILS		WIRE FENCE
	DUMP		BUILDING
	SOIL SAMPLE		BARRIER POST
	XRF SAMPLE		GATE
	WATER SAMPLE GROUND AND SURFACE DRAINAGE		EDGE OF ASPHALT
	WATER WELL		EDGE OF GRAVEL
			SLOPE DIRECTION
			WASTE ROCK
			TAILINGS POND

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

WRIGHT LODGE PA# 23--045  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

**PIONEER**  
ENGINEERING & CONSULTANTS

**TDSH**

DRAWN: MWC DATE: 10/93  
DESIGNED: TPR JOB NO.: 93-17  
APPROVED: F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS - BOZEMAN - KALISPELL - MONTANA  
SPOKANE - WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A





# SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1	WR	200	Upper most dump	None	N/A	N/A	N/A	N/A	N/A
WR-2A	WR	2,100	Southeast of collapsed adit; near top	None	6.4 (D)	0.08	23-045-WR-2	06/07/93 1650	T-Metals, ABA
WR-2B	WR		Southwest side of WR-2	None	5.0 (D)	0.06			
WR-3	WR	220	Southeast of adit; on top of dump	None	6.7 (D)	0.06			
WR-4A	WR	17,400	End of northern lobe	None	6.2 (D)	0.06	23-045-WR-4	06/07/93 1700	T-Metals, ABA
WR-4B	WR		Center of southwestern lobe	None	6.7 (D)	0.05			
WR-4C	WR		North end of main dump	None	6.8 (D)	0.055			
WR-4D	WR		Center of main dump	None	5.8 (D)	NM			
WR-4E	WR		South end of main dump	None	6.8 (D)	0.05			
SS-1	BKGND	N/A	Background soil east of WR-4, approx. 150 feet above road on top of WR-4	N/A	N/A	N/A	23-045-SS-1	06/07/03 1540	T-Metals

\* Direct reading (Ecolog Meter); 5-Second Probe (Clem Meter)

Comments or deviations from SOPs: 23-045-WR-2 is composite of WR-2A and -2B, and WR-3. 23-045-WR-4 is composite of WR-4A through -4E. NM = Not Measured

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 5 miles?: Yes X, No\_\_\_;  
Number of well logs: 3

Distance to nearest well used for drinking? Approx. 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.

Impacted surface water appears to infiltrate into the ground, probably causing localized impacts to the groundwater.

Other observations/notes: N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Unnamed tributary to Galena Creek

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-3 and WR-4

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)?     

High Flow: 0.20 cfs, Average Flow: 0.02 cfs to dry

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; water flows over and through WR-3 and WR-4.

Surface water draining onto or through waste sources: Yes X, No     , Describe: Water flows over and through WR-3 and WR-4.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Residential use (Hughesville); wetlands; endangered plant along Dry Fork Belt Creek approx. 1 mile from confluence with Galena Creek.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? .5 mi Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Runoff event during site visit; runoff was very turbid, looked milky; waste dump sediment is being carried downstream for 1/2 mile.



**SAMPLERS:** Bullock, Flammang

FLOW: Estimated (E) or Measured (M)?

MDSL AMRB/PIONEER 4/9/93

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)  
Presence of evaporative salt deposits? (ESD)  
Discolored or turbid seepage? (SPG)  
Presence of long filamentous algae in drainages, mosses in moist areas?  
Presence of ferric hydroxide precipitates? (FEOX)  
Presence of burned or stressed vegetation? (VEG)  
pH ≤ 5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes     , No X, Describe:                     

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30 X; 30-100     ;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments   

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, Flammang, Clark

[illegible]

Notes and Clarifications: All waste rock dumps were wet because of storm event that was occurring.

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30 X; 30-100\_\_\_\_; 100-300\_\_\_\_; 300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_; Comments \_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations: \_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number\_\_\_\_, types and locations: Many pits and trenches scattered throughout area ranging up to 10' deep.

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_, Number 3, types and locations: WR-4 has steep unstable banks on both sides of the drainage; WR-2 has one unstable slope.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain: \_\_\_\_\_

## Bibliography

Chen-Northern, Final Report on Preliminary Assessment of Hughesville District and Galena Creek, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL, Environmental Assessment Analytical Data for Wright Lode, Prepared by MSE, Inc., August 17, 1990.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Wright Lode, Prepared by Chen-Northern, August 30, 1989.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.



LABORATORY ANALYTICAL DATA

WRIGHT LODE  
PA NO. 23-045



Wright Lode PA# 23-045  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-045-WR-2	280	183	3.4 J	1.2 U	2.1	246 J	21400	0.427 J	16.7 J	2 U	8430	4 U	640 J	NR
23-045-WR-4	316	170	1.7 J	1.2 U	1.2	83.6 J	17900	0.649 J	22.6 J	3 J	14200	11	393 J	NR
BACKGROUND	29	270	0.6 U	3.1 J	7	11.6 J	11100	0.053 J	359 J	5 J	241	5 U	28 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT.		SULFUR ACID BASE POTENT.		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE POTENT.	
	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000	%	t/1000
23-045-WR-2	1.42	44.4	-4.8	-49.	1.24	-49.	0.02	0.62	0.16	0.62	0.02	0.62	-5.44	-5.44
23-045-WR-4	1.6	50	-3.3	-53.	1.55	-53.	<0.01	0	0.05	0	<0.01	0	-3.33	-3.33

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
23-045-SW-1	888	182	79	14.4	5.2	624	79300	1.02	4560	29.8	12700	64.7	14500	47.9
23-045-SW-2	0.98 U	44.1	2.55 U	5.99 U	5 U	1.35 U	26.7	0.038 U	2.6 U	8.78 U	0.48	27.9	75.2	8.6

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
23-045-SW-1	486	< 5.0	229	< 0.05	NR
23-045-SW-2	106	< 5.0	11	< 0.05	NR

LEGEND

WR2 - Composite of all samples WR2A, 2B, and 3.  
WR4 - Composite of all samples WR4A, 4B, 4D and 4E.  
BACKGROUND - From the Wright Lode (23-045-SS-1).  
SW1 - At base of waste rock dump 4.  
SW2 - Above waste rock dump 3.





**XRF ANALYSIS RESULTS**

**WRIGHT LODE  
PA NO. 23-045**



Mine Name: Wright Lode PA# 23-045  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-045-WR2-A	20801.4	3024.61	1331.78				21131.6		188.364 *	164.039 *		360.155
23-045-WR2-B	27845.5	5429.32	1638.25				25190.1		295.1	497.328		290.198
23-045-WR3-A	25723.3	2957.99	2290.07				31024.4		100.733 *	1166.51		579.033
23-045-WR4-A	20100.6	2018.74	1532.62				34675.1		90.0491 *	754.108		353.489
23-045-WR4-B	17957.5	3157.79	1495.25				24725.3			212.215	348.27	480.092
23-045-WR4-C	1574.12	2358.56	6228.07				34578.3	648.602 *		88.0504 *	50.4012 *	64.0884
23-045-WR4-D	31531.2	13678.2	2036.43				46004.4		103.275 *	610.973		635.397
23-045-WR4-D-DUP	22431.3	10574.9	1331.19				38377.4	412.899 *	84.8538 *	505.198		520.265
23-045-WR4-E	24550.5	1885.55	1264.98				13350.5		100.981 *	212.039		323.06
23-045-WR-2-COMP	24943 \$	3210 \$	1545 \$		47 \$	592 \$	26785 \$	402 \$	243 \$	909 \$		314 \$
23-045-WR-4-COMP	23151 \$	3701 \$	1979 \$			388 \$	27183 \$	122 \$	36 \$	410 \$		478 \$
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-045-WR2-A	206.909		8.02889 *	4808.92	221.028			933.834	57.4023 *			
23-045-WR2-B	219.384	57.1945 *	10401.7	10401.7	212.772			758.566	139.624 *		43.395 *	
23-045-WR3-A	269.01		157211 *	6714.18	220.33		43.6857 *	1918.56	183.676 *		55.4413 *	
23-045-WR4-A	241.424		8.02162 *	6387.91	198.61		48.2644 *	1656.24	159.623 *		40.9565 *	
23-045-WR4-B	283.348		74.0226	186.88	161.021			1169.02	71.8925 *	21.4022 *	28.0365 *	
23-045-WR4-C	475.2			26.1004 *				94.2405	69.9139 *	26.3801 *	30.3243 *	
23-045-WR4-D	294.979			5125.83	289.764			2202.27	124.194 *	31.019 *	31.5141 *	
23-045-WR4-D-DUP	234.622	63.8492 *						1178.62	99.8485 *	22.47 *	50.3463 *	
23-045-WR4-E	256.631		7.15218 *	3208.26	234.985			1193 \$	111 \$	23 \$	36 \$	
23-045-WR-2-COMP	220 \$	50 \$	7 \$	8080 \$	235 \$		21 \$	2402 \$	133 \$	17 \$	38 \$	
23-045-WR-4-COMP	276 \$	27 \$	30 \$	3425 \$	231 \$							

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

WRIGHT LODE  
PA NO. 23-045





# **AIMSS SCORESHEET**

SITE NAME:

WRIGHT LODGE

PA NUMBER:

23-045

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	150.984
6		WELLS - 1 MI. x 2.5		2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI		2
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	4.5
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>271771</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	165.865
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		3
18		WETLANDS		10
19	SW - TARGETS	FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	20
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>2653840</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.494
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>1871</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.270
40	DIRECT CONTACT	POPULATION - 1 MILE		10
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	10
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>2270</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			<b>29.30</b>
	(LINES 10 + 24 + 35 + 44) / 100,000			

SITE NAME:  
PA NUMBER:

WRIGHT LODGE  
23-045

LINE  
NO.

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	10
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>

**SUMMARY OF HISTORICAL ANALYTICAL DATA  
FROM OTHER SOURCES**

**TABLE 5-1**  
**SUMMARY OF SOIL AND MINE WASTE SAMPLE LOCATIONS**  
**GALENA CREEK PRELIMINARY ASSESSMENT**

Location	No. of Sample Sites	Location	No. of Sample Sites
Block P Mill Tailings	6	Marcelline	3
Block P Dump	11	Liberty	3
Wright/Edwards Dump	5	Carter	2
Danny T	2	Bender Creek SST	5
Belt SST <sup>1</sup>	1	Barker SST	2
Native <sup>2</sup>	4		

1 SST = Streamside Tailings

2 Native soil sample collected from below various waste material locations.

Waste rock dump material was collected from six of the larger waste dumps for a total of 24 sample sites. These six mine waste dumps were chosen because they represented a large proportion of the total amount of mine waste in the district and were regarded as having the greatest potential for impacting surface and groundwater in the project area. Of the 24 sample sites, 16 sample sites were located on the Block P Mine dump and the Wright and Edwards dumps, two of the largest waste rock dumps in the district (Figure 5-1).

Mill tailings samples were collected from six sites located on the Block P Mill tailings ponds (Figure 5-1). Three sample sites were located on the lower pond and three sites on the upper pond.

Samples of streamside tailings material were collected from three different tailings deposition areas on both Galena Creek and the Dry Fork of Belt Creek. The largest of these tailing deposits, the Bender Creek tailings (Figure 5-1), is believed to have been

**TABLE 5-2**  
**SOIL AND MINE WASTE ANALYTICAL METHODS**  
**AND REQUIRED DETECTION LIMITS**  
**GALENA CREEK PRELIMINARY ASSESSMENT**

Analyte <sup>(1)</sup>	Method <sup>(2)</sup>	Detection Limit (mg/kg)
Aluminum	EPA 6010	40
Arsenic	EPA 7060/7061	2
Cadmium	EPA 6010	1
Chromium	EPA 6010	2
Copper	EPA 6010	5
Iron	EPA 6010	20
Lead	EPA 6010	1
Manganese	EPA 7471	3
Mercury	EPA 6010	0.04
Nickel	EPA 6010	8
Silver	EPA 6010	2
Zinc	EPA 6010	4
Sulfur Fractionation	ASTM D24920-84	
Texture	ASA 43-5	---
pH	USDA 21A	---
Electrical Conductivity	USDA 4B	---

(1) Samples selectively analyzed for total and saturated paste extract metals.

(2) EPA, 1979 (revised 1983). Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020. Environmental Monitoring and Support Laboratory, U.S. EPA, Cincinnati, Ohio.

Annual Book of ASTM Standards, 1985.

American Society for Testing and Materials,

American Society of Agronomy, 1965. Standard Methods of Soil Analysis. Monograph No. 9. C.A. Black, ed. Madison, Wisconsin.

USDA, 1969. Diagnosis and Improvement of Saline and Alkali Soils, Agricultural Handbook No. 60. L.A. Richards, ed. U.S. Government Printing Office, Washington D.C.

samples, nine streamside tailings samples, and four native soil samples were submitted to Chen-Northern's Billings laboratory for analysis. Of these procedures, 40 total metal, 25 saturated paste extract metal, 13 sulfur fractionation, 31 texture, and 45 pH, EC, and saturation percent determinations were made. All samples collected were analyzed with the XRF for total metal concentrations.

**TABLE 5-6**  
**SUMMARY STATISTICS FOR METAL CONCENTRATIONS**  
**IN WASTE ROCK MATERIAL**  
**BY XRF AND LABORATORY ANALYSIS**  
**GALENA CREEK PRELIMINARY ASSESSMENT**

Element	Mean <sup>1</sup> (mg/kg)	Standard Deviation	Minimum <sup>2</sup> (mg/kg)	Maximum (mg/kg)
Arsenic	513	463	48	2,984
Copper	210	348	-20	2,140
Iron	38,090	29,290	10,120	148,000
Lead	11,800	10,860	291	52,000
Nickel	10	8	-5	42
Zinc	904	794	78	3,835

1 Summary statistics based on 42 samples.

2 Negative numbers indicate the predictive model could not estimate low concentrations.

**TABLE 5-7**  
**COMPARISON OF TOTAL METAL GROUP MEANS BASED ON**  
**WASTE ROCK DUMP LOCATIONS**  
**GALENA CREEK PRELIMINARY ASSESSMENT**

Dump Name	N <sup>1</sup>	Concentration (mg/kg)					
		Arsenic	Copper	Iron	Lead	Nickel	Zinc
Block P	16	397	102	33,690	10,540 <sup>+</sup>	8	665
Wright/Edwards	9	793	152	26,090	17,160	7	1,090
Liberty	5	597	170	29,020	16,430	5	747
Marcelline	4	567	163	31,020	14,920	9 <sup>+</sup>	1,222
Danny T	2	446	320 <sup>+</sup>	40,380	7,314 <sup>+</sup>	19 <sup>*</sup>	2,522 <sup>*</sup>
Carter	6	321	614 <sup>*</sup>	79,330 <sup>*</sup>	2,652 <sup>*</sup>	19 <sup>*</sup>	640

1 N = number of samples.

\* Asterisk indicates significant difference (P = 0.10) for marked samples.

+ Plus indicates group mean is not significantly different than mean marked with an asterisk.

SITE NAME: BELT PATENT  
DATE: 16-Aug-90

STATION	FLOW (gpm)	SPECIFIC			COMMENTS
		pH (s.u.)	CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
GALENA CK (UPGRADIENT)	75-100	5.55	429	14.1	DANGERD BLOCK P SAMPLE SERVES AS UPGRAD BELT
GALENA CK (DANGERDIENT)	75-100	5.53	439	14.1	UPGRAD MARCELLINE SAMPLE SERVES AS DANGERD DL

SITE NAME: BLOCK P MINE  
DATE: 17-Aug-90

STATION	FLOW (gpm)	SPECIFIC			COMMENTS
		pH (s.u.)	CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SEEP (TRAM BUILDING)	1-2	3.45	1010	11.2	SOURCE MAY BE ADIT BEHIND THE BUILDING
STREAM (WEST DRAINAGE)	11	4.12	79	10.1	
QUEEN ADIT	6	6.49	375	7.9	
GALENA CK (UPGRADIENT) (CALCULATED)	104?	7.62	220	11.3	SAMPLE COLLECTED
GALENA CK (DANGERDIENT)	107	5.79	365	10.8	SAMPLE COLLECTED, LOCATED AT HUGHESVILLE RD C BELOW THE BLOCK P DUMP

SITE NAME: WRIGHT & EDWARDS MINES  
DATE: 17-Aug-90

STATION	FLOW (gpm)	SPECIFIC			COMMENTS
		pH (s.u.)	CONDUCTANCE (umhos/cm)	TEMP. (celsius)	
SEEP (BLW ED'S DUMP)	1-2	2.50	1760	12.2	SEEP @ TOE OF EDWARD'S ADIT DUMP IN DRAINAGE
ACID STREAM	4	2.71	1090	11.0	
FRESH STREAM	3	6.00	147	12.1	ALKALINITY = 77 mg/l as CaCO3
COMBINED STREAM	13	6.68	152	12.5	
COMBINED STREAM (BLW DUMP)	14	6.00	173	14.2	ADIT & DUMP APPROX 200 YD ABOVE HUGHESVILLE R STREAM FLOWS INTO GALENA CK AT THE MARCELLINE







23-045, #13: Adit #1 (upper adits)



23-045, #15: WR-3 with water trickling out



23-045, #14: WR-2

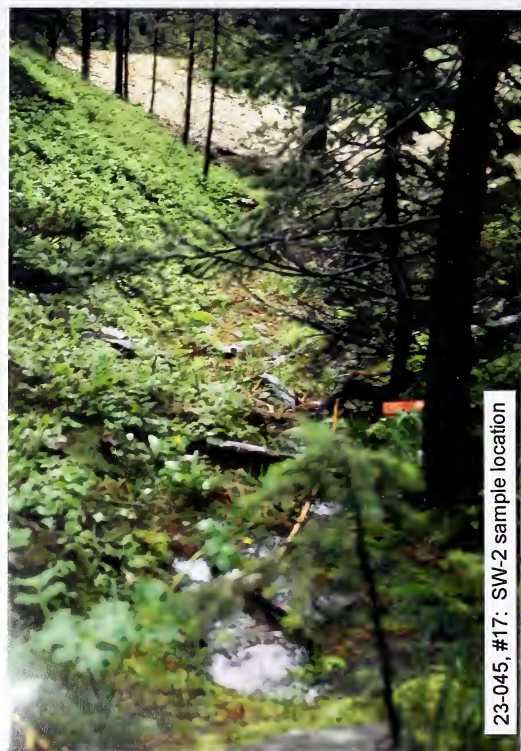


23-045, #16: SW-1 sample location





23-045, #18: WR-4 lower part with drainage across it



23-045, #17: SW-2 sample location



23-045, #19: WR-4 upper part



MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: EDWARDS PA#: 23-046

Date: June 7, 1993 Time: 1245

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H  
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Overcast, drizzling, raining  
last 24 hours; cool; heavy runoff around 2 p.m.; no breeze; cool,  
wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #7: WR-1; #8: Adit  
#3; #9: WR-2; #10: Adit at WR-2; #11: Adit (collapsed). No video  
was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Site is very similar to that described by Alan English of Chen-  
Northern. Except the English visit was in August during dry  
conditions and Pioneer had a spring runoff event during this  
investigation.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Waste rock  
has high lead levels and could be reprocessed for lead. Waste rock  
should be bermed from water.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): EDWARDS PA#: 23-046

Legal Description: T 15N; R 9E; Sec. 7, NW 1/4 NW 1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 04' 55" Longitude: W 110° 38' 16"

Primary Drainage Basin and Code: Galena Creek/10030105

Secondary Drainage Basin: Unnamed Tributary to Galena Creek

USGS Quadrangle map name(s): Barker

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc

Activity Status: Active     , Inactive/Exploration     , Abandoned X.

Ownership status: Known YX N; private/public? Private/Public  
Owner, Agent, or Contact (include address and phone when available): Della  
Antonioli, Emerald Resources, 1405 Steele, Butte, MT 59701. (406)  
723-8730; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district: Down-  
gradient of Wright mine

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is currently  
listed under the CECRA Program.

General site features: Elevation 6120', Slope 30°,  
Aspect Half East, half West (a drainage divides the site)

Land use: Mining X, Recreational     , Residential     , Urban     ,  
Agricultural     , Other (Specify)     

Area of disturbed/unvegetated lands? 1.6 acres.  
Dimensions:     

Predominant vegetation types: Conifer, aspen

Access: roads - good X, poor     , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). An unnamed tributary to Galena Creek flows  
from the northwest through WR-1. The tributary enters Galena Creek  
approx. 0.5 mile from the site. Vein is in well defined fissure in  
a mass of granular syenite which has intruded Barker porphyry.

Mining/milling history, ore type/tenor, host rock, gangue: The  
claim was located in 1880. The sulfide minerals are mainly galena,  
sphalerite, marmatite, pyrite, tetrahedrite, and chalcopryrite.  
Gangue minerals consist of quartz, calcite, barite, chodochrosite,  
and altered syenite or granite porphyry.

Mine Operation?

Shafts - Yes     , No X, #     , Comment None observed  
Adits - Yes X, No     , # 3, Comment 1 obvious and open; 2  
obtrusive  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A



Montana Bureau of Mines and Geology  
Water Well Log Data

05/12/1993

Well No.: M:1996  
Location: 16N 09E 04 BACB  
Site Name: MALMBERG, SWEDE\*13 MI W SURPRISE CK COLONY  
County: Judith Basin  
Depth: 320.0  
Yield: 6.0  
Static Water Level: 171.11  
Pumping Water Level: 220.0  
Year drilled: 1978  
Driller: THATCHER DRILLING  
Driller's License: 305  
DNRC Well No.: 19819

Well No.: M:28095  
Location: 16N 09E 04 BBDA  
Site Name: MALMBERG SWEDE  
County: Judith Basin  
Depth: 441.0  
Yield: 3.0  
Static Water Level: 377.00  
Pumping Water Level: 280.0  
Year drilled: 1976  
Driller: THATCHER DRILLING  
Driller's License: 086  
DNRC Well No.:

Well No.: M:28096  
Location: 16N 09E 07 ADCB  
Site Name: BODNER MIKE  
County: Judith Basin  
Depth: 70.0  
Yield: 26.0  
Static Water Level: 0.00  
Pumping Water Level: 24.0  
Year drilled: 1958  
Driller:  
Driller's License:  
DNRC Well No.:





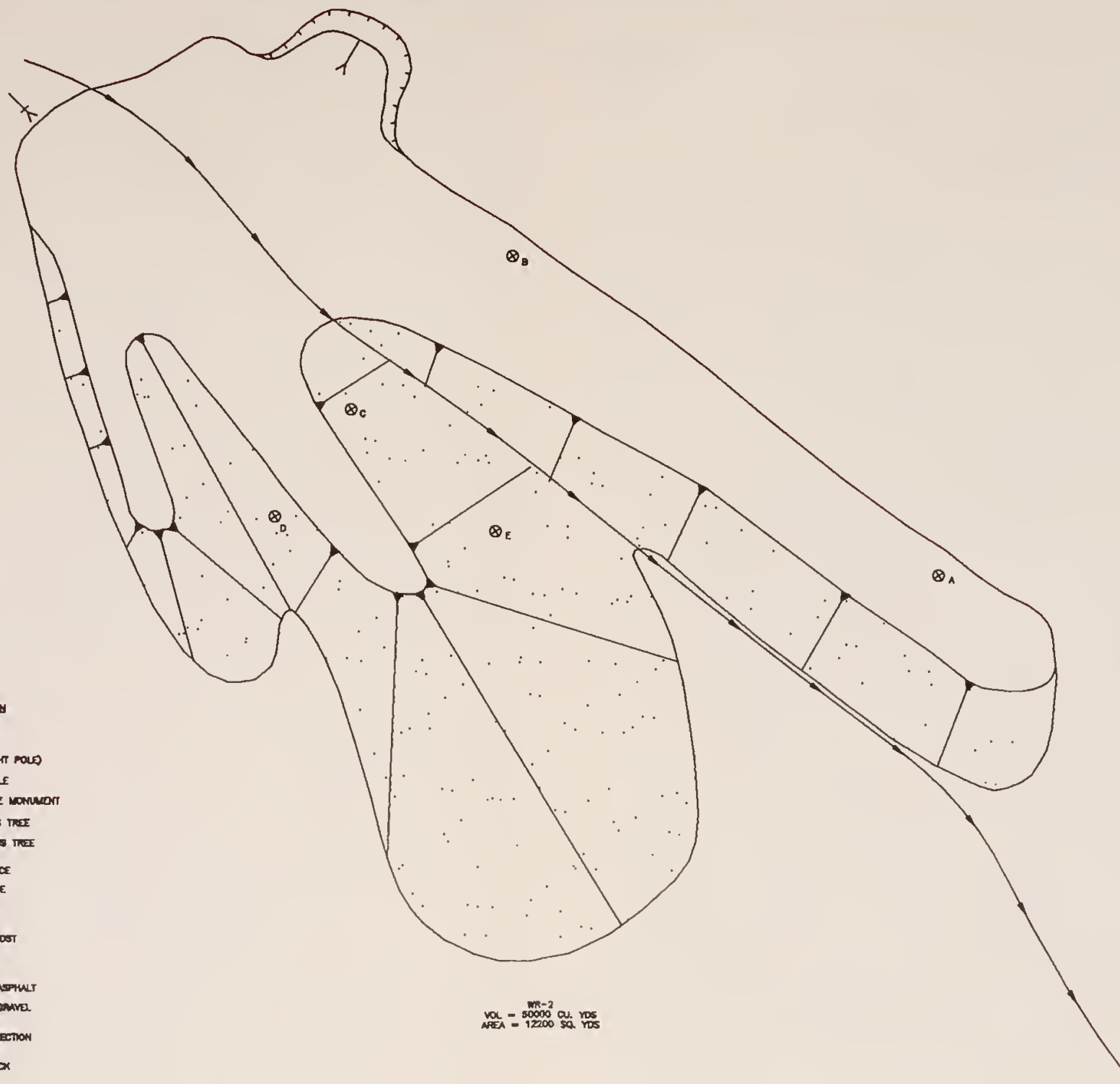
SCALE: 1" = 1000'



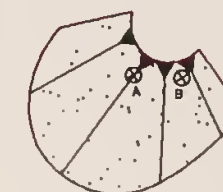
EXISTING	DESCRIPTION
	OPEN ADIT
	COLLAPSED ADIT
	OPEN SHAFT
	COLLAPSED SHAFT
	EXCAVATION
	WASTE ROCK DUMP
	COLLAPSED TIMBERS
	RAILS
	DUMP
	SOIL SAMPLE
	XRF SAMPLE
	WATER SAMPLE GROUND AND SURFACE DRAINAGE
	WATER WELL
	POWER LINE
	WETLANDS VEGETATION

# LEGEND

EXISTING	DESCRIPTION
	CULVERT
	LIGHT (LIGHT POLE)
	UTILITY POLE
	CENTERLINE MONUMENT
	DECIDUOUS TREE
	CONIFEROUS TREE
	WOOD FENCE
	WIRE FENCE
	BUILDING
	BARRIER POST
	GATE
	EDGE OF ASPHALT
	EDGE OF GRAVEL
	SLOPE DIRECTION
WR	WASTE ROCK
TP	TAILINGS POND



WR-2  
VOL = 50000 CU. YDS  
AREA = 12200 SQ. YDS



WR-1  
VOL=750 CU. YDS.  
AREA=375 SQ. YDS.

MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

EDWARDS PA# 23-046  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

PIONEER  
PROFESSIONAL SERVICES, INC. BUTTE, MT.

TDSH

SHEET NO.

23-046.DWG SHEETS

DRAWN BY: MWC DATE: 10/93  
DESIGNED BY: TPR JOB NO.: 93-17  
APPROVED BY: F.B. NO.

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL MONTANA  
SPOKANE WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): \_\_\_\_\_  
N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): \_\_\_\_\_  
N/A

Comments on potential for mitigation: \_\_\_\_\_  
N/A





SAMPLERS: Babits, Pierson, Lasher

[illegible]

D-Direct reading (Kelvyn Meter);  $\beta$ -Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** 23-046-WR-2 is composite of WR-2A through -2E.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Groundwater wells within 4 miles?: Yes X, No\_\_\_;

Number of well logs: 21

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable X, Possible\_\_\_, Unlikely\_\_\_.

Uncontained source (waste rock dumps) with significant metals levels and shallow water table.

Other observations/notes: N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Unnamed tributary to Galena Creek

Dry streambeds: Yes    , No X, Name(s):    

Other surface water: Yes    , No X, Name(s)/Description:    

Waste materials within any floodplain: Yes X, No     Source ID(s): WR-1 and -2 have sloughed to unnamed tributary.

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.79 cfs during sampling  
High Flow: 2.0 cfs, Average Flow: 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No    ,  
Describe: Unnamed tributary flows through WR-2; the tributary begins upgradient of WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Possible irrigation and wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X, No    , Distance downstream (ft)? 0.5 mi Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Unnamed tributary has green filamentous algae; was very turbid during sampling.



**SAMPLERS:** Babits, Pierson

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): See the Wright Lode (23-045-SW-1) for the upgradient sample for this site.

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? \_\_\_\_\_

Wetlands present: Yes \_\_\_, No X, Describe: Not on-site

Carbonate rocks/soils: Yes \_\_\_, No X, Describe: None were observed.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 \_\_\_; 10-30 \_\_\_; 30-100 X;  
100-300 \_\_\_; 300-1,000 \_\_\_; 1,000-3,000 \_\_\_; 3,000-10,000 \_\_\_; 10,000 or  
greater \_\_\_; Comments \_\_\_\_\_

Nearest residence(ft or miles)? 1 mile

For each source (table next page):

Available fine materials?	Surface area?
Uncovered and unvegetated?	Wet or dry?
Overall dust propagation potential:	
observed	high
moderate	low
none	



## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Babits, Pierson, Lasher

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: Nearest residents are in Hughsville.

Population within 1 mile: 1-10\_\_\_\_; 10-30 X; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: No  
vehicle or pedestrian traffic was evidenced.

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes <u>X</u> , No____, Comment <u>Endangered plants</u>
Bat Habitat -	Yes <u>X</u> , No____, Comment <u>Adit</u>

Primary Drainage\_\_\_\_; Secondary Drainage X; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 6  
Sport Fishery Classification - 6

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
One open adit

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
No buildings on site

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 2, types and locations: Waste rock dumps sloughing to  
surface water.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Edwards, Prepared by Chen-Northern, August 29, 1989.

USBM, Mineral Industry Survey, Information Circular 7602, Author Unknown, 1946.

USGS, Topographic Map, Barker, Montana, 7 1/2 minute Quadrangle, 1961.



LABORATORY ANALYTICAL DATA

EDWARDS  
PA NO. 23-046



Edwards PA# 23-046  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BABITS  
INVESTIGATION DATE: 06/07/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	Cyanide (mg/Kg)
23-046-SE-2	526	182	3.5 J	1.4 U	1.4	68.4 J	19700	0.187 J	131 J	2 U	4740	4	645 J	NR
23-046-SE-6	379	220	2.3 J	11.9 J	7.3	139 J	66400	0.275 J	1800 J	11 J	4040	5 U	562 J	NR
23-046-WR-2	649	170	3.3 J	1.6 U	2.2	499 J	28400	1.87 J	10.9 J	4 J	24900	19	827 J	NR
BACKGROUND	29	270 J	0.6 U	3.1 J	7	11.6 J	11100	0.053 J	359 J	5 J	241	5 U	28 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
23-045-SW-1	888	182	79	14.4	5.2	624	79300	1.02	4560	29.8	12700	64.7	14500	47.9
23-046-SW-2	1020	164	106	15.5	8.13	812	105000	1.05	6640	49.1	12900	48	19400	73.3
23-046-SW-6	13.9	20.6	13.2	5.99 U	5 U	57.8	5150	0.087	869	10.9	14.5	18.3 U	2130	76.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision

Wet Chemistry

Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-045-SW-1	486	< 5.0	229	< 0.05	NR
23-046-SW-2	730	< 5.0	381	< 0.05	NR
23-046-SW-6	141	< 5.0	60	< 0.05	NR

LEGEND

SE2 - Below waste rock dump 1 in tributary.

SE6 - Unnamed tributary just prior to confluence with Galena Creek.

WR2 - Composite of subsamples WR2A, 2B, 2C, 2D, and 2E.

BACKGROUND - From the Wright Lode Mine (23-045-SS-1).

SW1 - At base of waste rock dump 4 from 23-045 site.

Upgradient sample of the Edwards Mine.

SW2 - Same as sample SE2.

SW6 - Same as sample SE6.





**XRF ANALYSIS RESULTS**

**EDWARDS  
PA NO. 23-046**



Mine Name: Edwards PA# 23-046  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-046-WR1-A	195 \$	16856 \$	3266 \$	3412 \$			20105 \$		102 \$	817 \$		596 \$
23-046-WR1-B	216 \$	13433 \$	2331 \$	2557 \$	67 \$	351 \$	22508 \$	112 \$	163 \$	641 \$		516 \$
23-046-WR2-A	192 \$	19120 \$	11218 \$	2970 \$	54 \$	137 \$	43792 \$	239 \$	304 \$	620 \$		315 \$
23-046-WR2-B		21243 \$	4326 \$	3196 \$			34583 \$		179 \$	2398 \$		365 \$
23-046-WR2-C		24632 \$	2040 \$	2778 \$			33216 \$	201 \$	266 \$	397 \$		309 \$
23-046-WR2-D		31105 \$	1545 \$	1120 \$	66 \$		33737 \$	415 \$	433 \$	706 \$		289 \$
23-046-WR2-E		36242 \$	1613 \$	1200 \$	102 \$	154 \$	12900 \$		94 \$	1654 \$		279 \$
23-046-WR-2-COMP		29319 \$	3788 \$	3816 \$		358 \$	34653 \$		163 \$	1230 \$		333 \$
23-046-WR-2-COMP-DUP		29680 \$	3789 \$	3906 \$			33965 \$		203 \$	1295 \$		325 \$
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-046-WR1-A	376 \$			3081 \$	204 \$	115 \$	31 \$	2347 \$	86 \$	36 \$	50 \$	
23-046-WR1-B	287 \$			4025 \$	195 \$		26 \$	4295 \$	114 \$	31 \$	46 \$	
23-046-WR2-A	224 \$	18 \$	6 \$	3566 \$	146 \$	96 \$	16 \$	1012 \$	96 \$	28 \$	15 \$	
23-046-WR2-B	236 \$		11 \$	5357 \$	149 \$	71 \$	53 \$	1439 \$	142 \$	18 \$	44 \$	
23-046-WR2-C	291 \$		7 \$	6675 \$	200 \$	64 \$	19 \$	1658 \$	202 \$	22 \$	51 \$	
23-046-WR2-D	257 \$		6 \$	14113 \$	237 \$		106 \$	960 \$	325 \$	9 \$	68 \$	
23-046-WR2-E	241 \$			2735 \$	325 \$	61 \$	18 \$	1362 \$	146 \$	34 \$	39 \$	
23-046-WR-2-COMP	281 \$	22 \$		6186 \$	208 \$	174 \$	20 \$	1119 \$	226 \$	28 \$	58 \$	
23-046-WR-2-COMP-DUP	285 \$	82 \$		6234 \$	210 \$	123 \$	34 \$	1090 \$	220 \$	31 \$	67 \$	

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

EDWARDS  
PA NO. 23-046





# AIMSS SCORESHEET

SITE NAME:

EDWARDS

PA NUMBER:

23-046

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C 400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 758.950
6		WELLS - 1 MI. x 2.5	2.5
7	GW - TARGETS	WELLS - 1 TO 4 MI	20
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 22.5
10		GROUNDWATER SCORE	LINES 4 x 5 x 9 6830550
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B 400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 833.697
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	3
18		WETLANDS	10
19	SW - TARGETS	FISHERY	0
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	5
23		TARGETS SCORE	SUM LINES 16 - 22 25
24		SURFACE WATER SCORE	LINES 14 x 15 x 23 8336970
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	15
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B 75
27		LIKELIHOOD SCORE	LINES 25 + 26C 75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 27.790
29		POPULATION - 4 MILES	30
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	5
34		TARGETS SCORE	SUM LINES 29 - 33 35
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34 72949
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF	ACCESSIBILITY	20
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B 100
38		LIKELIHOOD SCORE	LINES 36 + 37C 100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 25.298
40	DIRECT CONTACT	POPULATION - 1 MILE	10
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42 10
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43 25298
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		152.66

LINE  
NO.

SITE NAME:

EDWARDS

PA NUMBER:

23-046

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	50
9		POPULATION - 1 MILE		10
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	10
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>10.00</b>



23-046, #8: Adit #3



23-046, #10: Open adit at WR-2



23-046, #7: WR-1



23-046, #9: WR-2





23-046, #11: Adit (collapsed)

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: HARRISON PA#: 23-056

Date: June 3, 1993 Time: 1600

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer  
Clark, Pioneer

Visitors: Earl McCurley, MDSL  
Rick Burger, MDSL

Weather/Seasonality Observations: Partly cloudy to cloudy; cool  
(approx. 45°F); small shower/sleet; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #32: WR-2; #33: WR-  
1; #34: GW-1; #35: SW-2 upgradient. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):  
N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study water  
treatment requirements and alternatives. Isolate water from the  
waste rock dumps; grade, amend, and revegetate.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): HARRISON PA#: 23-056

Legal Description: T 15N ; R 9E ; Sec. 6 , SE 1/4 NE 1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 05' 24" Longitude: W 110° 37' 22"

Primary Drainage Basin and Code: Galena Creek/10030105

Secondary Drainage Basin: Daisy Creek

USGS Quadrangle map name(s): Mixes Baldy

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc

Activity Status: Active ☐ , Inactive/Exploration ☐ , Abandoned ☒ .

Ownership status: Known ☒ N ☐ ; private/public? Private/Public

Owner, Agent, or Contact (Include address and phone when available): Peter

Antonioli, Jr., 1405 Steele, Butte, MT 59701. (406) 723-8730;

George Croff, 8884 St. Paul Hwy NE, Aurora, OR 97002. (503) 236-

5387; Lewis and Clark National Forest.

Relationship to other mines/sites in the area/district:

Developed by the same company (Moulton Consolidated Mining) as

the Belfont, Moulton, Pioneer, Tiger, and T.W. Lodes

Regulatory Status (Activity by other agencies)? Hardrock permits?

Past Reclamation Activities? The Hughesville district is listed

under CECRA.

General site features: Elevation 6400' , Slope 15° ,

Aspect North

Land use: Mining ☒ , Recreational ☒ , Residential ☐ , Urban ☐ ,

Agricultural ☐ , Other (Specify)

Area of disturbed/unvegetated lands? 1 acres.

Dimensions:

Predominant vegetation types: Douglas fir, Subalpine fir,

Engleman spruce, alder, pine grass

Access: roads - good ☐ , poor ☐ , 4wd ☒ , trail ☐ .

Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBWG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies on and in the south side of Daisy Creek, which flows west-southwest past the site to confluence with perennial Galena Creek 1/2 mile below the site. Galena Creek flows south to Dry Fork Belt Creek approx. 3 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: No history found in literature. Vehicles on the site indicate the mine was last worked in the 1950's or 1960's.

Mine Operation?

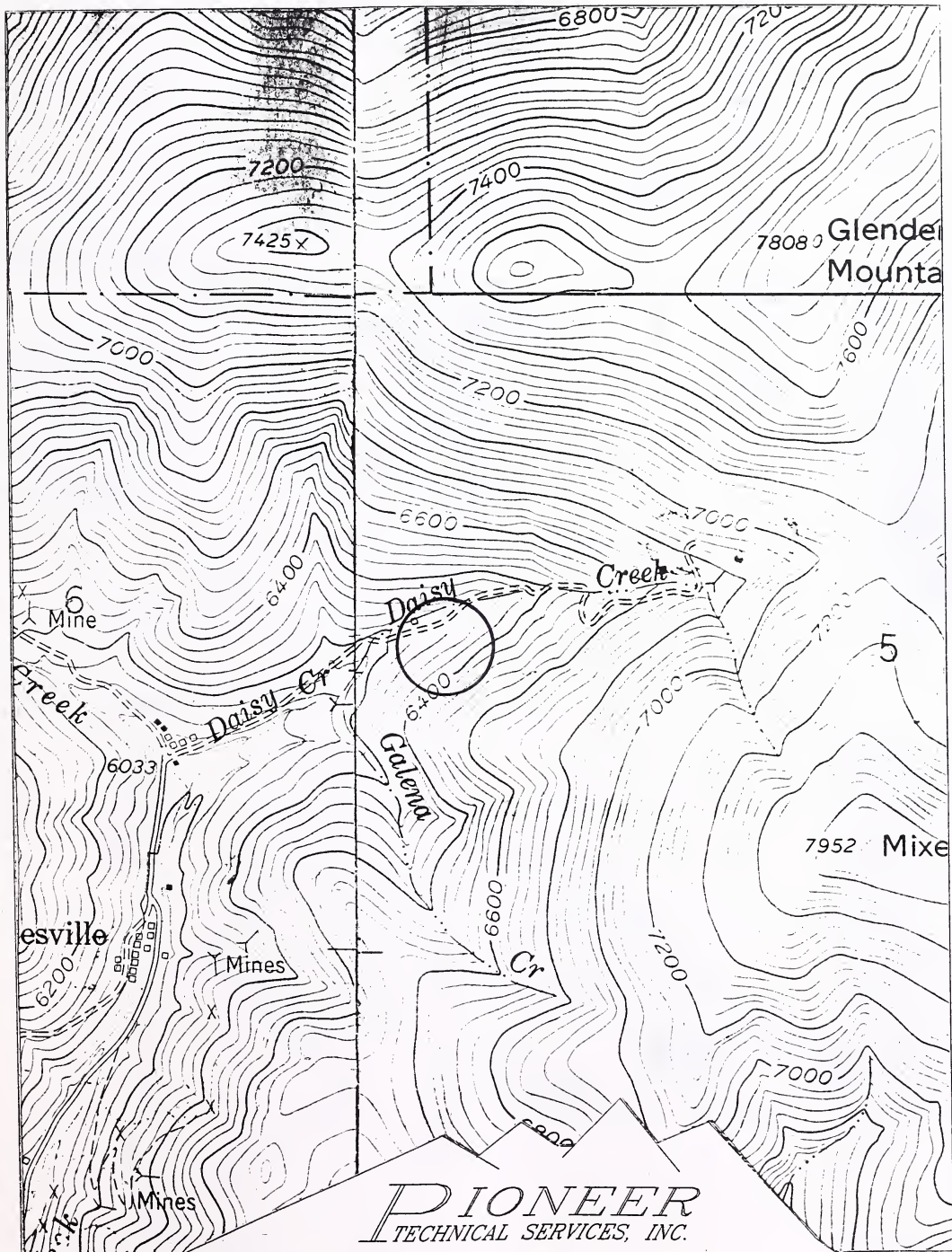
Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Collapsed  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes     , No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting? N/A



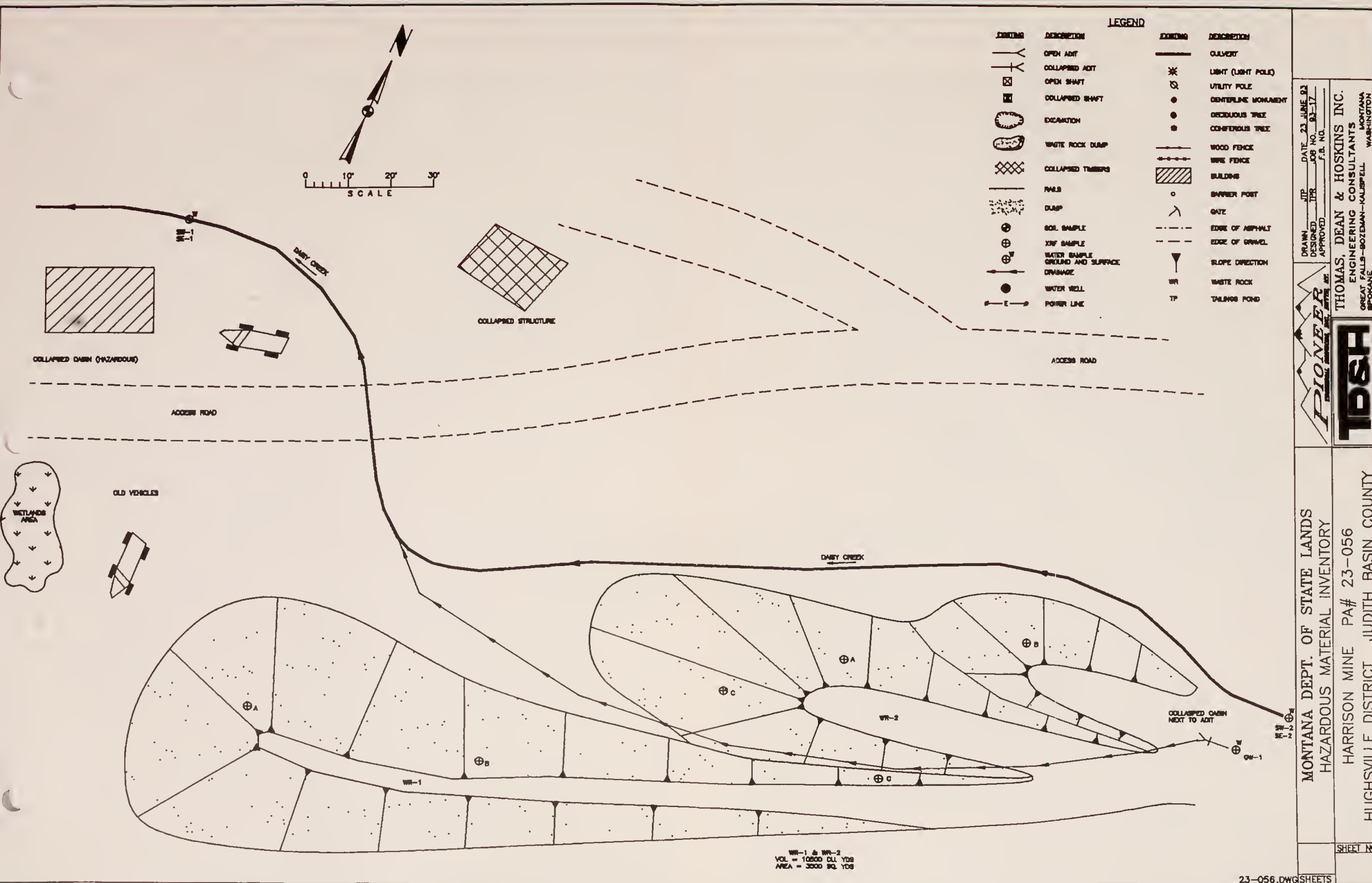
**PIONEER**  
TECHNICAL SERVICES, INC.

HARRISON, P.A. NO. 23-056

T15N, R09E, SECTION 06

SCALE: 1" = 1000'





MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

HARRISON MINE PA# 23-056  
HUGHSVILLE DISTRICT JUDITH BASIN COUNTY

DRAWN: JTP DATE: 23 JUNE 93  
DESIGNED: JTP JOB NO.: 93-17  
APPROVED: J.B. NO.

PIONEER  
TBSH

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

WR-1 & WR-2  
VOL = 10000 CU YDS  
AREA = 3000 SQ YDS



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A







**SAMPLERS:** Flammanq

[illegible]

D-Direct reading (Kelway Meter) ; B-Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** The volume given is a summation of WR-1 and WR-2. 23-056-WR-1 is composite of all waste rock subsamples.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No    , Number: 1 Identification: Adit #1

Filled shafts: Yes    , No X, Number:     Identification:    

Seeps/Springs: Yes    , No X, Number:     Identification:    

Groundwater wells within 5 miles?: Yes X, No    ;

Number of well logs: 21

Distance to nearest well used for drinking? Approx. 1.5 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), Ph (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite    , Probable    , Possible X, Unlikely    .

Dump metal concentrations and SO<sub>3</sub> present indicate potential for groundwater contamination if water infiltrates through the waste material.

Other observations/notes: Adjacent drainage is intercepted by adit several hundred feet upgradient from the site and water travels subsurface below the ground in the adit.

**SAMPLERS: Bullock**

[illegible]

FLOW: Estimated (E) or Measured (M) from edt, shaft, seam or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Daisy Creek and adit discharge flowing through dump

Dry streambeds: Yes     , No X, Name(s):     

Other surface water: Yes     , No X, Name(s)/Description:     

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1 and -2 are in Daisy Creek.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)?       
High Flow: 7.5 cfs, Average Flow: 0.75 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Adit discharge bisects WR-1 and WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, stock watering, fishery, wetlands

Observed erosional/sedimentation/stream turbidity problems? Yes X, No     , Distance downstream (ft)? 500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):  
Mine waste makes up majority of sediment; multiple sources upgradient. Iron-staining present on the rocks and gravels for approx. 500 feet in the stream.



**SAMPLERS:** Bullock

[illegible]

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

##### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

##### General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 3-4 acres present  
suitable for wetlands

Wetlands present: Yes X, No    , Describe: Out of Daisy Creek in seep  
area below the mine approx. 1/4 acre in size

Carbonate rocks/soils: Yes    , No X, Describe:                     

#### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 X; 10-30    ; 30-100    ;  
100-300    ; 300-1,000    ; 1,000-3,000    ; 3,000-10,000    ; 10,000 or  
greater    ; Comments                     

Nearest residence(ft or miles)? Approx. 1.25 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
            observed              high              moderate              low              none

**SAMPLERS:** Flammang

[illegible]

### Notes and Clarifications:



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X,  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes X, No\_\_\_\_, Describe: Some  
evidence of hunters using area

Accessibility - Fences, warning signs, closed roads? "No Trespassing"  
signs

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium____, Low <u>X</u>
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Cabin collapsing  
\_\_\_\_\_  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes X, No\_\_\_\_, Number 2,  
types and locations: Dump slopes are steep.  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 2, types and locations: WR-1 and -2 are steep and eroding into  
Daisy Creek.  
\_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Harrison, Prepared by Chen-Northern, September 11, 1989.

USGS, Topographic Map, Mixes Baldy, Montana, 7 1/2 minute Quadrangle, 1961.



LABORATORY ANALYTICAL DATA

HARRISON  
PA NO. 23-056



Harrison/Moulton PA# 23-056  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - BULLOCK  
INVESTIGATION DATE: 06/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-056-SE-1	306 J	1720 J	12.2	4.03	5.2 J	2590 J	151000	1.1	8610	47.2	134000	14 J	3590	NR
23-056-SE-2	58.6 J	825 J	4.3	5.91	7.46 J	374 J	44000	0.106	4820	35.1	4360	4.24 UJ	2120	NR
23-056-WR-1	182 J	670 J	9.0	3.2	6.24 J	1270 J	90300	0.75	12900	68.5	10600	6.43 J	2330	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.027	548	7.93	61.4	3.98 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			ORGANIC SULFUR			PYRITIC SULFUR			SULFUR		
	%	1/1000	POTENT.	NEUTRAL.	POTENT.	1/1000	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.	%	1/1000	POTENT.
23-056-WR-1	4.26	133	66.4	-66.	1.53	1.08	1.65	33.7	32.6									

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn (mg CaCO3/L)	HARDNESS CALC.
23-056-GW-1	0.98 U	19.8	11.4	5.99 U	5 U	516 J	704	0.038 U	2970	23.9	26.8	18.3 U	2470 JX	355
23-056-SW-1	1.37	32.5	6.37	5.99 U	5 U	325 J	4760	0.038 U	1990	21.9	312	18.3 U	2060 JX	214
23-056-SW-2	0.98 U	19.9	8.3	5.99 U	5 U	133 J	4530	0.043	1600	19.9	369	18.3 U	2340 JX	127

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/L

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-056-GW-1	495	< 5.0	217	0.11	NR
23-056-SW-1	307	< 5.0	178	0.11	NR
23-056-SW-2	200	< 5.0	129	0.16	NR

LEGEND

SE1 - Downstream of dumps and confluence of adit discharge.  
SE2 - Upstream of possible influence from dumps.  
WR1 - Composite of all samples WR1A, 1B, 1C, 2A, 2B, and 2C.  
BACKGROUND - From the Tiger Mine (23-059-SS-1).

GW1 - Adit discharge.  
SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.





**XRF ANALYSIS RESULTS**

**HARRISON  
PA NO. 23-056**



## XRF Field Analyses Results in PPM

\* – Estimated Quantity  
\$ – Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

HARRISON  
PA NO. 23-056



# AIMSS SCORESHEET

SITE NAME:

HARRISON

PA NUMBER:

23-056

LINE NO.		GROUNDWATER PATHWAY	
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD	CONTAINMENT	20
3B	OF RELEASE	GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6		WELLS - 1 MI. x 2.5	116.804
7	GW - TARGETS	WELLS - 1 TO 4 MI	0.0
8		NEAREST WELL	21
9		TARGETS SCORE	LINES 6 + 7 + 8
10		GROUNDWATER SCORE	LINES 4 x 5 x 9
			981154
		SURFACE WATER PATHWAY	
11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD	EXCEEDENCES	0
13A	OF RELEASE	CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16		DRINKING WATER POP'N	129.479
17		IMPACTED DRAINAGE	0
18	SW - TARGETS	WETLANDS	1
19		FISHERY	10
20		RECREATION	1
21		IRRIGATION/STOCK	5
22		T & E SPECIES HABITAT	2
23		TARGETS SCORE	SUM LINES 16 - 22
24		SURFACE WATER SCORE	LINES 14 x 15 x 23
			1722071
		AIR PATHWAY	
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD	CONTAINMENT	10
26B	OF RELEASE	DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29		POPULATION - 4 MILES	1.194
30		NEAREST RESIDENCE	1
31	AIR - TARGETS	WETLANDS	0
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33
35		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			60
		DIRECT CONTACT PATHWAY	
36		OBSERVED EXPOSURE	50
37A	LIKELIHOOD OF	ACCESSIBILITY	10
37B	EXPOSURE	DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40	DIRECT CONTACT	POPULATION - 1 MILE	1.079
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42
44		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			216
45	TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE		
	(LINES 10 + 24 + 35 + 44) / 100,000		27.04



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13

PA NUMBER:

23-056

THREAT

## OPEN SHAFTS

100 EA.

OPEN ADITS

50 EA.

## HAZARDS

UNSTAB. HIWALLS / PITS

75 EA.

HAZ. STRUCTURES

40 EA.

## EXPLOSIVES

HAZ. MATERIALS

HAZARDS SCORE

SUM LINES 2 - 7

## TARGETS

POPULATION - 1 MILE

NEAREST RESIDENCE

RECREATIONAL USE

### TARGETS SCORE

SUM LINES 9 - 11

### SITE SAFETY SCORE

(LINES 1 x 8 x 12) / 1,000

10

00

00

150

40

0

00

190

0

0

2

2

**3.80**





MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MOULTON PA#: 23-058

Date: June 3, 1993 Time: 1745-1830

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: Earl McCurley, MDSL/AMRB  
Rick Burger, MDSL Helicopter Pilot

Weather/Seasonality Observations: Overcast; 35°F; began to snow during investigation.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #26: Upstream of adit; #27: Downgradient; #28-#30; Waste rock dump; #31: Adit.  
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Immediately above Moulton is an unknown waste rock dump assumed to be from the Pioneer mine. Upgradient from Pioneer is the Tiger mine; downgradient from Moulton is the Harrison mine. Water flowing from adit which may be seepage from Daisy Creek flowing adjacent to adit or groundwater flow. Access to site was by helicopter.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Route adit discharge around waste dumps; may need treatment prior to discharge. Waste rock dumps need amendments and revegetation, but high altitude will hamper vegetation. Keep stream away from dumps and adit.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MOULTON PA#: 23-058

Legal Description: T 15N ; R 9E ; Sec. 5 , SW 1/4 NW 1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 05' 27" Longitude: W 110° 36' 58"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Daisy Creek

USGS Quadrangle map name(s): Mixes Baldy

Mine Type/Commodities: Hardrock/Silver, Lead, Zinc, Gold

Activity Status: Active     , Inactive/Exploration     , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): George Croff,  
8884 St. Paul Hwy NE, Aurora, OR 97002. (503) 236-5387; Lewis and  
Clark National Forest.

Relationship to other mines/sites in the area/district: Below  
Tiger mine and unnamed dump; above Harrison mine.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is currently  
listed under the CECRA Program.

General site features: Elevation 6600' , Slope 25° ,  
Aspect Northeast

Land use: Mining     , Recreational X , Residential     , Urban     ,  
Agricultural     , Other (Specify)    

Area of disturbed/unvegetated lands? 0.5 acres.  
Dimensions: 200 feet x 110 feet

Predominant vegetation types: Spruce/fir forest

Access: roads - good     , poor X , 4wd     , trail     .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MDMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on intermittent Daisy Creek,  
which flows west past the site to confluence with perennial Galena  
Creek 0.5 miles below the site. Galena Creek flows south to  
southwest approx. 3 miles to confluence with Belt Creek.

Mining/milling history, ore type/tenor, host rock, gangue: Ore  
deposits are lenses in Barker porphyry along a contact between  
porphyritic syenite and porphyritic granite. Minerals are  
argentiferous galena, covellite, polybasite, and tetrahedrite.  
Gangue minerals are quartz and calcite.

#### Mine Operation?

Shafts - Yes     , No X, #     , Comment       
Adits - Yes X, No     , # 1, Comment Open  
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

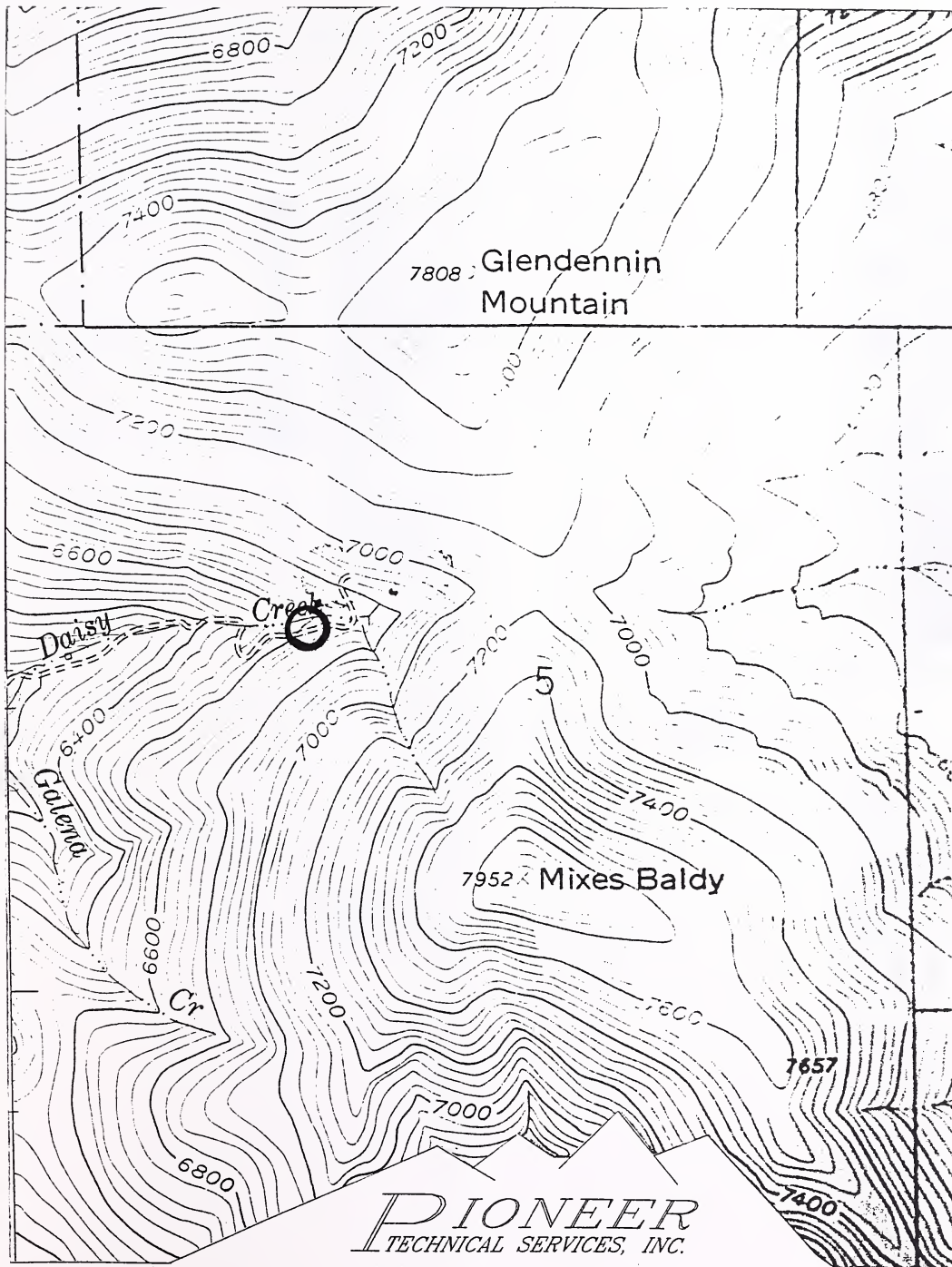
Mill Operation? Yes     , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
N/A





**PIONEER**  
TECHNICAL SERVICES, INC.

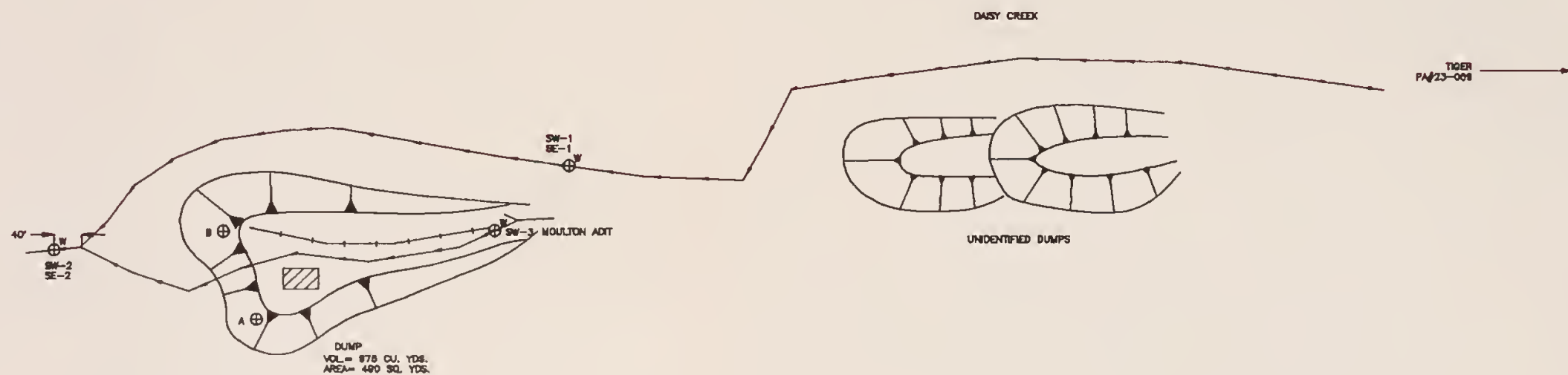
MOULTON, P.A. NO. 23-058

T15N, R09E, SECTION 05

SCALE: 1" = 1000'



SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	CULVERT	—	OPEN ADIT
✱	LIGHT (LIGHT POLE)	—	COLLAPSED ADIT
⊗	UTILITY POLE	⊗	OPEN SHAFT
●	CENTERLINE MONUMENT	⊗	COLLAPSED SHAFT
●	DECIDUOUS TREE	⊗	EXCAVATION
●	CONIFEROUS TREE	⊗	WASTE ROCK DUMP
—	WOOD FENCE	⊗	COLLAPSED TIMBERS
—	WIRE FENCE	—	RAILS
▨	BUILDING	⊕	SOIL SAMPLE
○	BARRIER POST	⊕	XRF SAMPLE
∧	GATE	⊕	WATER SAMPLE
- - -	EDGE OF ASPHALT	⊕	GROUND AND SURFACE
- - -	EDGE OF GRAVEL	→	DRAINAGE
▼	SLOPE DIRECTION	●	WATER WELL



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
MOULTON PA# 23-058  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

PIONEER  
ENGINEERING CONSULTANTS  
THOMAS, DEAN & HOSKINS INC.  
GREAT FALLS-BOZEMAN-KALISPELL  
SPokane MONTANA WASHINGTON

SHEET NO.  
23-058.DWG SHEETS



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



**SAMPLERS:** Tuesday, Belanger, Lasher

[illegible]

D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

**Comments or deviations from SOPs:** 23-058-WR-1 is composite of WR-1A and -1B.



## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No   , Number: 1 Identification: SW-3

Filled shafts: Yes   , No X, Number:    Identification:   

Seeps/Springs: Yes   , No X, Number:    Identification:   

Groundwater wells within 5 miles?: Yes X, No   ;

Number of well logs: 21

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite   , Probable X, Possible   , Unlikely   .

Adit is likely flowing some groundwater and contains high metals and sulfides; adit/dump are in shallow groundwater.

Other observations/notes: Unknown waste rock dump above Moulton site.  
Some of it's waste rock was over the top of the Moulton adit.

**SAMPLERS:** Tuesday, Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

**Comments or Deviations from the SOPs (Pioneer SAP, 1993):**

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Daisy Creek

Dry streambeds: Yes     , No X, Name(s):                     

Other surface water: Yes X, No     , Name(s)/Description:                       
Add discharge

Waste materials within any floodplain: Yes X, No      Source ID(s): WR-1

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.13 during investigation  
High Flow: 0.5 cfs, Average Flow: 0.1 cfs

Distance between waste source(s) and nearest surface water body (ft)?  
0 feet

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: Daisy Creek flows through north side of waste rock dump.  
Add discharge flows over dump and into Daisy Creek.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Daisy Creek flows into Galena Creek approx. 0.5 mile from the site;  
Galena Creek is severely degraded and probably not usable.

Observed erosional/sedimentation/stream turbidity problems? Yes X,  
No     , Distance downstream (ft)? 200 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):  
No streambank vegetation, and waste rock is present in stream channel.

**SAMPLERS:** Tuesday, Belanger

**FLOW: Estimated (E) or Measured (M)?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Note that 23-058-SW-1 is also Tiger mine's (23-059) further downgradient site sample.



#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides? (SO<sub>3</sub>)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH  $\leq$  5.0 (pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 0.5 to 1 acre

Wetlands present: Yes ☐ , No ☒ , Describe: \_\_\_\_\_

Carbonate rocks/soils: Yes\_\_\_, No\_\_\_, Describe: Possibly; upgradient site sample of Tiger mine (23-059) has a pH of 8 and a high alkalinity.

### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30\_\_\_; 30-100 X;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? 1/2 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:

observed	high	moderate	low	none

**SAMPLERS:** Tuesday, Belanger

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X;  
Describe:\_\_\_\_\_

Population within 1 mile: 1-10 X; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments\_\_\_\_\_

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe:\_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes____, No <u>X</u> , Comment_____
Wilderness Area -	Yes____, No <u>X</u> , Comment_____
T&E Species Habitat -	Yes____, No <u>X</u> , Comment_____
Bat Habitat -	Yes____, No <u>X</u> , Comment_____

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality -	High____, Medium <u>X</u> , Low____
Wetlands Frontage -	High____, Medium____, Low <u>X</u>
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Open adit\_\_\_\_\_

Hazardous structures: Yes X, No\_\_\_\_, Number 1, types and locations:\_\_\_\_  
Old shed on-site\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes X, No\_\_\_\_,  
Number 1, types and locations: WR-1 is eroding into Daisy Creek.

Fire and/or Explosion hazards: Yes\_\_\_\_, No X, Explain:\_\_\_\_\_



## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Moulton, Prepared by Chen-Northern, September 11, 1989.

MDSL/AMRB Files, Montana Bureau of Mines and Geology, State Technical Services Mine Visit Report for Moulton, Prepared by Ken Bondurant, August 24, 1967.

USGS, Topographic Map, Mixes Baldy, Montana, 7 1/2 minute Quadrangle, 1961.



LABORATORY ANALYTICAL DATA

MOULTON  
PA NO. 23-058



Moulton PA# 23-058  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
23-058-SE-1	89 J	617 J	5.8	5.29	18 J	299 J	108000	0.146	2370	21.5	8670	8.19 J	2440	NR
23-058-SE-2	47.1 J	871 J	2.6	1.45 U	4.69 J	241 J	52300	0.302	674	8.7	8620	4.68 J	1200	NR
23-058-WR-1	57.2 J	794 J	4.7	5.63	8.79 J	618 J	65300	0.261	8360	52.7	22400	8.85 J	1540	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.027	548	7.93	61.4	3.98 UJ	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR			SULFUR			PYRITIC SULFUR			PYRITIC SULFUR			ACID BASE POTENTIAL		
	TOTAL SULFUR %	ACID BASE %	NEUTRAL. POTENTIAL t/1000	TOTAL SULFUR %	ACID BASE %	NEUTRAL. POTENTIAL t/1000	PYRITIC SULFUR %	SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR t/1000	ACID BASE POTENTIAL t/1000	PYRITIC SULFUR t/1000	ACID BASE POTENTIAL t/1000	ACID BASE POTENTIAL t/1000	ACID BASE POTENTIAL t/1000
23-058-WR1	2.89	90.3	117	26.8	0.37	1.48	1.04	46.2	70.8						

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO <sub>3</sub> /L)
23-058-SW-1	0.98 U	33.8	20	5.99 U	5 U	186 J	9450	0.038 U	2530	36.3	667	21.9	4950 JX	160
23-058-SW-2	2.42	30.3	22.3	5.99 U	5 U	377	15100	0.079 J	5360	48.1	958	18.3 U	5990	218
23-058-SW-3	3.56	10.8	34.7	11.5	5 U	917	41900	0.068 J	12400	92.8	1660	18.3 U	7980	327

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO <sub>3</sub> /NO <sub>2</sub> -N	CYANIDE
23-058-SW-1	265	< 5.0	173	0.28	NR
23-058-SW-2	365	< 5.0	244	0.27	NR
23-058-SW-3	714	< 5.0	470	0.3	NR

LEGEND

SE1 - Upgradient Daisy Creek.  
SE2 - Downgradient Daisy Creek.  
WR1 - Composite of all samples WR1A and 1B.  
BACKGROUND - From the Tiger Mine (23-059-SS-1).

SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Audit discharge.



**XRF ANALYSIS RESULTS**

**MOULTON  
PA NO. 23-058**





Moulton PA# 23-058  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-058-SE-1	18962.5	3359.55	1700.77		2402.38	1057.16			226.798 *	1303.63		136.884
23-058-SE-2	25789.3	2534.7	2260.26		618.263 *	44289.1			240.185 *	955.012		136.465
23-058-WR1-A	25634.7	2608	1431.79		9114.88	54530.1			96.7958 *	1827.24		211.317
23-058-WR1-B	15205.4	42772.8	1763.57		4454.98	62985.7			507.182	1160.09		199.268
23-058-WR-1-COMP	16043.9	41257.7	1576.37		3433.1	67969.3			646.826	1218.89		179.065
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-058-SE-1	210.525		8.65783 *	6166.23	100.269			879.893	93.1141 *			
23-058-SE-2	254.764		4335.8	4335.8	157.908			2715.11	75.3238 *	17.528 *	34.003 *	
23-058-WR1-A	236.817		26.6588 *	2881.61	137.114	138.64 *		1686.71	102.305 *	17.6481 *	19.1403 *	
23-058-WR1-B	190.417		12.0452 *	6469.12	102.945	195.851 *		2384.12	177.07 *		33.5561 *	
23-058-WR-1-COMP	223.365			8282.6	91.9386 *			2618.06	188.769 *	22.7977 *		

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

MOULTON  
PA NO. 23-058



# **AIMSS SCORESHEET**

SITE NAME:

MOULTON

PA NUMBER:

23-058

LINE NO.				
<b>GROUNDWATER PATHWAY</b>				
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	6,734
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		21
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	21.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9</b>	<b>56566</b>
<b>SURFACE WATER PATHWAY</b>				
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7,423
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18	SW - TARGETS	WETLANDS		10
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	11
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23</b>	<b>40827</b>
<b>AIR PATHWAY</b>				
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0,247
29		POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	30
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34</b>	<b>371</b>
<b>DIRECT CONTACT PATHWAY</b>				
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0,225
40	DIRECT CONTACT	POPULATION - 1 MILE		1
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	1
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43</b>	<b>6</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			<b>0.98</b>
	(LINES 10 + 24 + 35 + 44) / 100,000			

LINE NO.			SITE NAME:	MOULTON
			PA NUMBER:	23-058
	<b>SITE SAFETY</b>			
1	THREAT	ACCESSIBILITY		5
2	HAZARDS	OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	40
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	90
9	TARGETS	POPULATION - 1 MILE		1
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	1
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	0.45





23-058, #27: Downgradient of Adit



23-058, #29: WR



23-058, #26: Upstream of adit

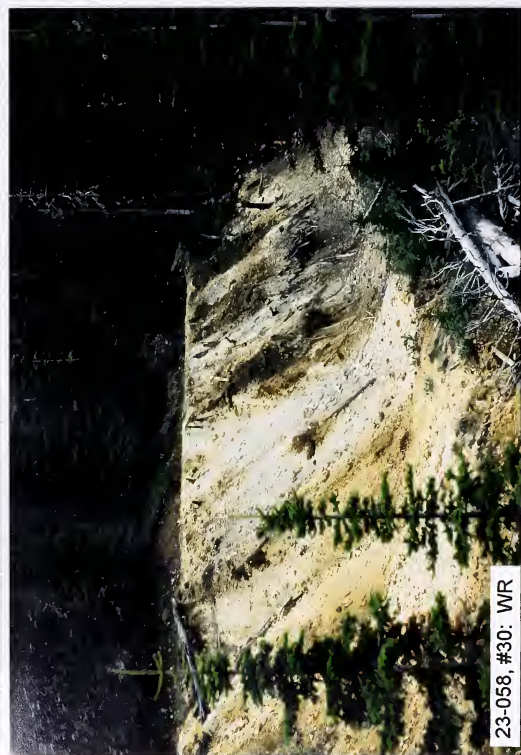


23-058, #28: WR





23-058, #31: Adit



23-058, #30: WR

MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: TIGER PA#: 23-059

Date: June 3, 1993 Time: 0930-1700

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer  
Lasher, Pioneer

Visitors: Rick Burger, MDSL Helicopter Pilot

Weather/Seasonality Observations: Cold; windy; mostly cloudy;  
cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #11: Adit #4, note  
seep; #12: WR-4 from Adit #4; #13: Adit #3; #14: Dump WR-3 from  
Adit #3; #15: Shaft #1 at WR-2; #16, #17: WR-2 dump from shaft and  
Adit #2; #18: WR-1 from Adit #1; #19: Adit HMO, note water  
discharge; #20: Adit flow joins dump seepage in drainage; #21:  
Background surface water, SW-1, SE-1; #22, #23: WRD-1 and adit; #24:  
WR-2, -3, -4 from across valley; #25: Background soil SS-1.

General Comments/Observations (not covered specifically in attached Inventory Forms):  
N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit  
discharges onto a highly pyrite-rich dump; close adit and route  
discharge into stream around or over dump without contact. Move  
lower dump WR-1 out of drainage. Revegetate other dumps. WR-2 is  
high in sulfide and will need amendments.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): TIGER PA#: 23-059

Legal Description: T 15N ; R 9E ; Sec. 5 , SW1/4NW 1/4 1/4

County: JUDITH BASIN Mining District: HUGHESVILLE

Latitude: N 47° 05' 29" Longitude: W 110° 36' 50"

Primary Drainage Basin and Code: Dry Fork Belt Creek/10030105

Secondary Drainage Basin: Daisy Creek

USGS Quadrangle map name(s): Mixes Baldy

Mine Type/Commodities: Hardrock/Lead, Silver, Zinc

Activity Status: Active      , Inactive/Exploration      , Abandoned X .

Ownership status: Known YX N ; private/public? Private/Public  
Owner, Agent, or Contact (Include address and phone when available): George Croff,  
8884 St. Paul Hwy NE, Aurora, OR 97002. (503) 236-5387; Lewis and  
Clark National Forest.

Relationship to other mines/sites in the area/district: Moulton  
and Pioneer sites are downstream.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? The Hughesville district is currently  
listed under the CECRA Program.

General site features: Elevation 6700' , Slope 28° ,  
Aspect Southwest

Land use: Mining      , Recreational X , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 4 acres.  
Dimensions: 300 feet x 600 feet

Predominant vegetation types: Spruce/fir forest

Access: roads - good      , poor      , 4wd X , trail      .  
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on intermittent Daisy Creek  
which flows west past the site to confluence with perennial Galena  
Creek 1/2 mile below the site. Galena Creek flows south to south-  
west approx. 3 miles to confluence with Belt Creek.

Mining/milling history, ore type/tenor, host rock, gangue: Ore  
deposits are lenses in Barker porphyry along a contact between  
porphyritic syenite and porphyritic granite. Minerals are galena,  
colvellite, polybasite, tetrahedrite, and quartz. Gangue minerals  
are quartz and calcite. Contained 30 to 40 percent lead and 18 to  
20 ounces silver per ton.

Mine Operation?

Shafts - Yes X, No    , # 1, Comment Mostly caved  
Adits - Yes X, No    , # 4, Comment 3 caved; 1 open  
Pits - Yes    , No X, #    , Comment      
Placers - Yes    , No X, #    , Comment      
Other - Yes    , No X, #    , Comment    

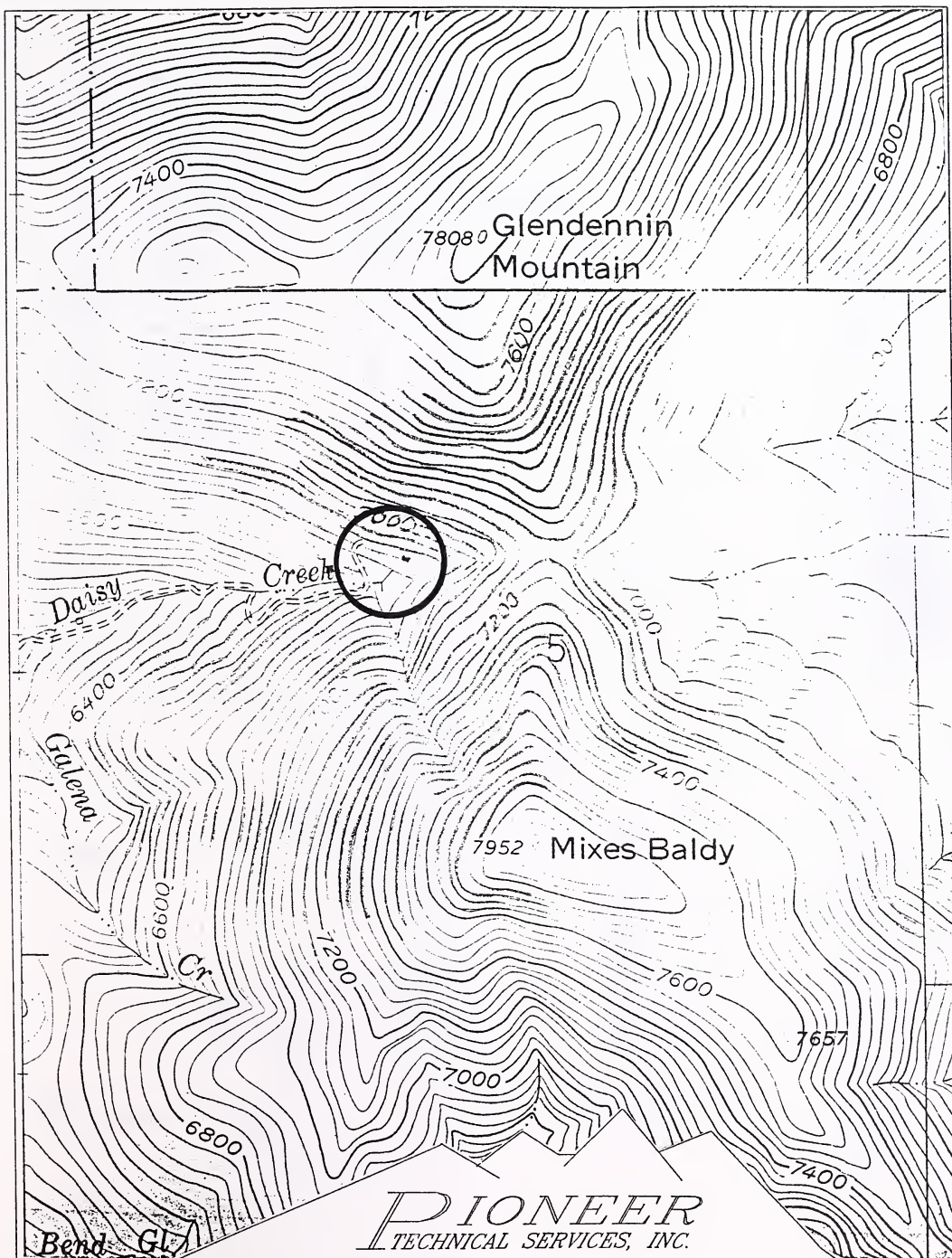
Mill Operation? Yes    , No X. If yes answer the next three  
questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill     Dedicated Mill    ; Number and  
names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN leach (vat, heap), floatation, smelting?  
N/A





TIGER, P.A. NO. 23-059

T15N, R09E, SECTION 05

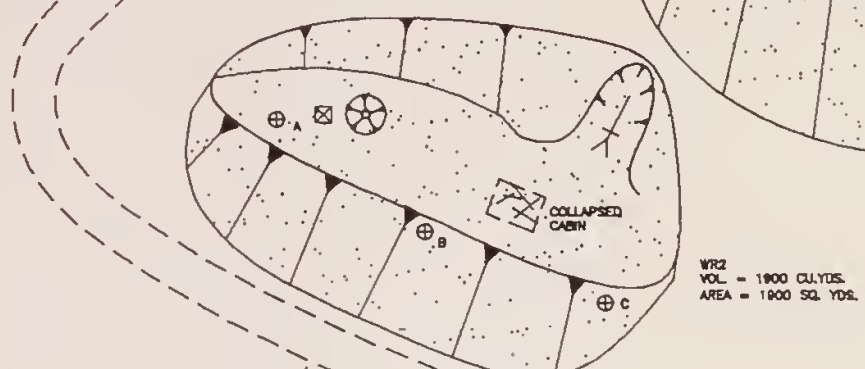
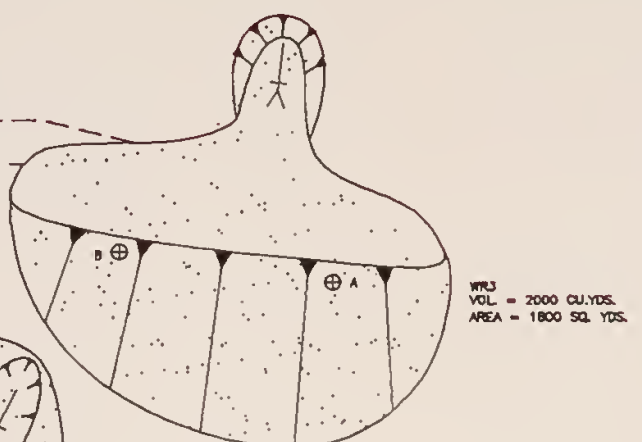
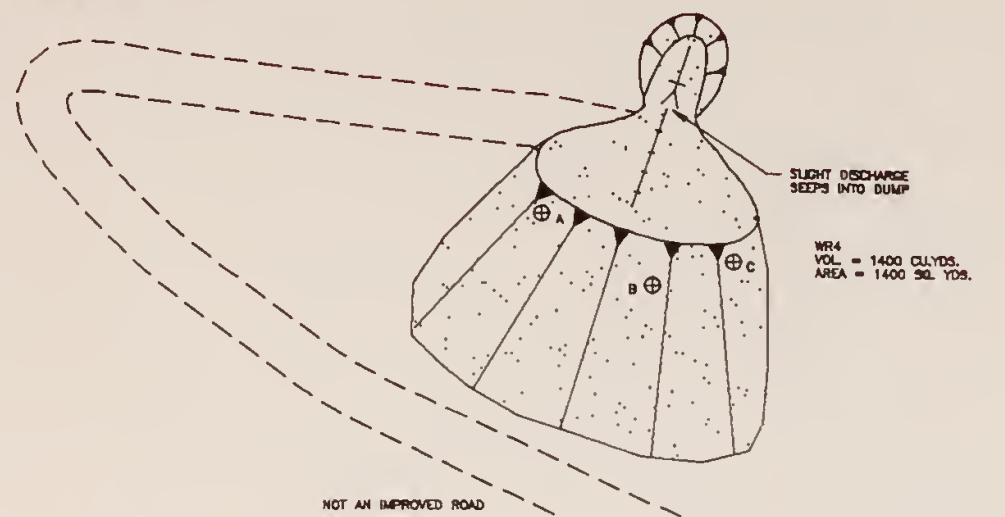
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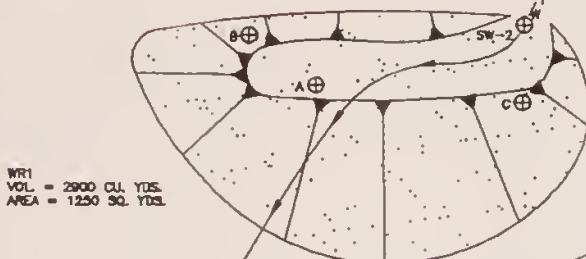


EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	CENTERLINE MONUMENT		COLLAPSED SHAFT
	DECIDUOUS TREE		EXCAVATION
	CONIFEROUS TREE		WASTE ROCK DUMP
	WOOD FENCE		COLLAPSED TIMBERS
	WIRE FENCE		RAILS
	BUILDING		SOIL SAMPLE
	BARRIER POST		XRF SAMPLE
	GATE		WATER SAMPLE GROUND AND SURFACE
	EDGE OF ASPHALT		DRAINAGE
	EDGE OF DRIVE		WATER WELL
	SLOPE DIRECTION		

OTHER ROADS  
IN AREA



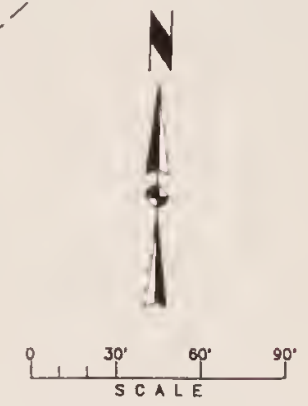
MOULTON  
PA# 23-059



SW-3  
SE-3

SW-1  
SE-1

DAISY CREEK



MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY

TIGER PA# 23-059  
HUGHESVILLE DISTRICT JUDITH BASIN COUNTY

PIONEER  
ENGINEERING CONSULTANTS

THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
MONTANA WASHINGTON

DRAWN JTP DATE 8 AUG 93  
DESIGNED JPR JOB NO. 93-17  
APPROVED MJB F.B. NO.

SHEET NO.



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A



# SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd <sup>3</sup> )	LOCATION/DESCRIPTION	CONTAINMENT	pH SU (D/S)	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/TIME	ANALYSES
WR-1A	WR	2,900	Lowest dump in Daisy Creek; east end	None	< 3.5 (D)	0.05	23-059-WR-1	06/03/93 1630	T-Metals, ABA
WR-1B	WR		Lowest dump in Daisy Creek; center, where discharge goes into creek	None	< 3.5 (D)	0.05			
WR-1C	WR		Lowest dump in Daisy Creek; west end	None	< 3.5 (D)	0.05			
WR-2A	WR	1,900	Second dump uphill, near shaft and cabin; west end	None	< 3.5 (D)	0.025	23-059-WR-2	06/03/93 1320	T-Metals, ABA
WR-2B	WR		Second dump uphill, near shaft and cabin; center	None	5.7 (D)	0.05			
WR-2C	WR		Second dump uphill, near shaft and cabin; east end	None	5.2 (D)	0.01			
WR-3A	WR	2,000	Third highest dump, assoc. with Adit #3; east end	None	5.8 (D)	0.06	N/A	N/A	XRF Analysis
WR-3B	WR		Third highest dump, assoc. with Adit #3; west end	None	5.3 (D)	0.05	N/A	N/A	XRF Analysis
WR-4A	WR	1,400	Highest dump uphill, assoc. Adit #4; west end	None	6.6 (D)	0.03	N/A	N/A	XRF Analysis
WR-4B	WR		Highest dump uphill, assoc. Adit #4; center	None	5.3 (D)	0.07	N/A	N/A	XRF Analysis
WR-4C	WR		Highest dump uphill, assoc. Adit #4; lower part	None	5.8 (D)	0.025			
SS-1	BKGND	N/A	Background soil south of site, across Daisy Creek near clear cut	None	6.0 (D)	0.03	23-059-SS-1	06/03/93	T-Metals

D-Direct reading (Kelway Meter); S-Saturated Paste (Orion Meter)

Comments or deviations from SOPs: 23-059-WR-1 is composite of WR-1A through -1C. 23-059-WR-2 is composite of WR-2A through -2C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No     , Number: 2 Identification: Adit #1 has major flow; small seep from Adit #4.

Filled shafts: Yes     , No X, Number:      Identification:     

Seeps/Springs: Yes X, No     , Number: 2 Identification: One east of mine in Daisy Creek drainage; one south of mine on hillside

Groundwater wells within 5 miles?: Yes X, No     ;  
Number of well logs: 21

Distance to nearest well used for drinking? The town of Hughesville is approximately 1 mile from the site.

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite     , Probable X, Possible     , Unlikely     .

Dumps have some elevated metal values (high pyrite/galena content); groundwater could be in contact (abundant water that is probably shallow).

Other observations/notes: N/A



SAMPLERS: Tuesday, Belanger

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No    , Name(s): Daisy Creek

Dry streambeds: Yes    , No X, Name(s):    

Other surface water: Yes X, No    , Name(s)/Description: Adit discharge is majority of flow in Daisy Creek.

Waste materials within any floodplain: Yes X, No     Source ID(s): WR-1

Approximate Flood frequency? X 1 yr,     10 yr,     100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.124 cfs  
High Flow: 0.5, Average Flow: 0.1

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; WR-1 is in Daisy Creek.

Surface water draining onto or through waste sources: Yes X, No    ,  
Describe: Adit discharge flows onto WR-1 dump.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
None in Daisy or Galena Creeks, except possibly wetlands. Dry Fork Belt Creek has wetlands and possible fishery.

Observed erosional/sedimentation/stream turbidity problems? Yes X,  
No    , Distance downstream (ft)? 1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):  
Dump sediment and iron oxides are all the way down Daisy Creek to Moulton and further.

SAMPLERS: Tuesday, Belanger

**FLOW: Estimated (E) or Measured (M)?**

MDSL AMRB/PIONEER 4/9/93

## D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? Less than 1 acre

Wetlands present: Yes     , No X, Describe:                     

Carbonate rocks/soils: Yes X, No     , Describe: Limestone contact with porphyry reported as 50 feet past adit.

## E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10     ; 10-30     ; 30-100 X;  
100-300     ; 300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or  
greater     ; Comments                     

Nearest residence(ft or miles)? 3/4 mile

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?      Wet or dry?

Overall dust propagation potential:  
observed      high      moderate      low      none



SAMPLERS: Tuesday, Belanger

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes ☐, No ☒, Describe: \_\_\_\_\_

Population within 1 mile: 1-10 ☒; 10-30 ☐; 30-100 ☐; 100-300 ☐; 300-1,000 ☐; 1,000-3,000 ☐; 3,000-10,000 ☐; 10,000 or greater ☐; Comments \_\_\_\_\_

Evidence of recreational use on site: Yes ☐, No ☒, Describe: \_\_\_\_\_

Accessibility - Fences, warning signs, closed roads? Easy access, but cannot drive to site; locked gate just off Galena Creek Road.

Sensitive environments on-site or adjacent to site:

State or National Parks -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____
Wilderness Area -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____
T&E Species Habitat -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____
Bat Habitat -	Yes <input type="checkbox"/> , No <input checked="" type="checkbox"/> , Comment _____

Primary Drainage ☒; Secondary Drainage ☐; No Information ☐:

Riparian Habitat Quality -	High <input type="checkbox"/> , Medium <input checked="" type="checkbox"/> , Low <input type="checkbox"/>
Wetlands Frontage -	High <input type="checkbox"/> , Medium <input type="checkbox"/> , Low <input checked="" type="checkbox"/>
Fisheries Habitat and Species Classification -	<u>4</u>
Sport Fishery Classification -	<u>3</u>

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes ☒, No ☐, Number 2, types and locations: Adit #1 open; Shaft #1 open, 10 feet deep

Hazardous structures: Yes ☐, No ☒, Number ☐, types and locations: Cabin is already collapsed.

Unstable highwalls, pits, trenches, slopes: Yes ☐, No ☒, Number ☐, types and locations: \_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes ☒, No ☐, Number 2, types and locations: WR-1 and WR-2

Fire and/or Explosion hazards: Yes ☐, No ☒, Explain: \_\_\_\_\_

## Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/SHWB, Superfund Basics, Overview and Accomplishments of Superfund in Montana 1983-1993, November 1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Tiger, Prepared by Chen-Northern, September 11, 1989.

MDSL/AMRB Files, Montana Bureau of Mines and Geology, State Technical Services Mine Visit Report for Tiger, Prepared by Ken Bondurant, July 28, 1967.

USGS, Topographic Map, Mixes Baldy, Montana, 7 1/2 minute Quadrangle, 1961.





LABORATORY ANALYTICAL DATA

TIGER  
PA NO. 23-059



Tiger PA# 23-059  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER - TUESDAY  
INVESTIGATION DATE: 06/03/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-059-SE-1	7.17 J	142 J	0.6 U	2.75	4.63 J	21.9 J	11500	0.090	542	7.09	165	4.48 UU	179	NR
23-059-SE-3	58.3 J	381 J	14.5	4.57	10.8 J	325 J	71200	0.090	3850	29.8	8590	8.52 J	5140	NR
23-059-WR-1	61.7 J	86.5 J	4.6	2.23	5.36 J	347 J	183000	0.051	556	6.46	16600	4.5 J	1770	NR
23-059-WR-2	41.6 J	403 J	12.5	3.84	5.57 J	221 J	32000	0.177	5080	32.7	15900	15.3 J	5460	NR
BACKGROUND	5.1 J	159 J	0.6 U	3.83	8.09 J	9.81 J	13300	0.027	548	7.93	61.4	3.98 UU	130	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL. POTENT.		SULFUR ACID BASE		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC SULFUR		SULFUR ACID BASE	
	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	%	1/1000x	POTENT.	1/1000x
23-059-WR1	27.6	862	-0.0	-862	4.32	-862	2.87	89.7	20.4	5	89.7	-89.7	15.5	
23-059-WR2	2.01	62.8	20.5	-42.	1.28	-42.	0.16	5	0.57					

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-059-SW-1	0.98 U	47.7	2.55 U	5.99 U	5 U	2.7 J	33.3	0.038 U	4.4	8.78 U	4.33	21.8	7.8 JX	57.3
23-059-SW-2	2.33	31.4	14.1	5.99 U	7.53 J	953 J	14300	0.038 U	2160	25.6	657	18.3 U	3610 JX	144
23-059-SW-3	1.64	38	14	5.99 U	5 U	137 J	5630	0.038 U	1320	23.6	343	18.3 U	3460 JX	136

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-059-SW-1	80	< 5.0	11	0.09	NR
23-059-SW-2	245	< 5.0	155	0.66	NR
23-059-SW-3	232	< 5.0	126	0.27	NR

LEGEND

SE1 - Upstream.  
SE3 - Downstream.  
SW1 - Same as sample SE1.  
SW2 - Add discharge.  
SW3 - Same as sample SE3.

WR1 - Composite of subsamples WR 1A, 1B, and 1C.  
WR2 - Composite of subsamples WR 2A, 2B, and 2C.  
BACKGROUND - South of site across Daisy Creek near clear cut  
From Tiger Mine (23-059-SS-1).



XRF ANALYSIS RESULTS

TIGER  
PA NO. 23-059





Mine Name: Tiger PA# 23-059  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	Cr:Hi	K	Ca	Ti	Cr:Lo	Mn	Fe	Co	Cu	Zn	As	Sr
23-059-SE-1	12717.2	5182.1	586.082	941.941 *	17536.4	2056.72	73877	323.997 *	221.694	3972.5	299.554	
23-059-SE-3	16828.4	6415.93	1491.5	2056.72	73877	217.29	17719.3	323.997 *	3972.5	145.32		
23-059-SS-1	19433.9	4553.27	3383.32	451.629 *	17719.3	1098.44 *	86837.4	402.454	3217.43	251.561		
23-059-WR1-A	27795.4	26378.5	1740.51	1098.44 *	86837.4	1147.81 *	132246	449.742	309.701	112.673		
23-059-WR1-B	551.137 *	22331	3547.41	978.566	1902.06 *	89820.4	94934.5	250.891 *	1505.52	217.11		
23-059-WR1-C	20133.2	19546.4	1762.42	1549.74 *	94934.5	1141.01	8738.05	1141.01	8738.05	131.606		
23-059-WR2-A	844.74 *	32811.9	7883.44	1504.69	94934.5	105.506 *	4010.82	247.372	247.372	247.372		
23-059-WR2-B	25081.4	7108.43	722.467	25081.4	722.467	269.735 *	972.404	269.735 *	972.404	261.047		
23-059-WR2-C	30567.7	2130.74	1278.57	741.057 *	55581.4	71.6275 *	3142.07	71.6275 *	3142.07	222.71		
23-059-WR3-A	26584.7	29569.6	2828.66	4359.27	33845.7	5237.88	3067.6	198.41 *	59.1979 *	153.932		
23-059-WR3-B	26433	23525.5	2784.48	5237.88	33845.7	16908	2590.26	511.993	2590.26	169.951		
23-059-WR4-A	4015.32	178859	1140.64	448.716 *	16908	2226.67	68446.5	2303.55	2303.55	92.4322		
23-059-WR4-B	34498.3	23888.6	2648.62	2226.67	32890.5	2607.45	96483.2	443.076 *	160.983 *	180.809		
23-059-WR4-C	33740.2	31990.4	2878.4	2607.45	68446.5	1176.31 *	96483.2	443.076 *	160.983 *	92.4322		
23-059-WR-1-COMP	27830.2	18879.9	1781.37	1176.31 *	96483.2	4162.14	44962.2	443.076 *	160.983 *	180.809		
23-059-WR-2-COMP	27984.8	5411.07	1196.5	4162.14	44962.2	44962.2	44962.2	443.076 *	160.983 *	180.809		
Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th		
125.946	125.946	171.561	171.561	171.561	171.561	171.561	1179.83	48.5747 *	39.0704	29.5136 *		
23-059-SE-1	125.946	171.561	171.561	171.561	171.561	171.561	1179.83	48.5747 *	39.0704	29.5136 *		
23-059-SE-3	181.764	134.545	134.545	134.545	134.545	134.545	1675.2	180.09 *	29.5136 *	26.0053 *		
23-059-SS-1	278.524	147.466	147.466	147.466	147.466	147.466	977.464	188.418 *	26.4343 *	26.4343 *		
23-059-WR1-A	146.915	125.674	125.674	125.674	125.674	125.674	263.632 *	256.94	142.345 *	38.6263 *		
23-059-WR1-B	55.9671	42.4762 *	42.4762 *	42.4762 *	42.4762 *	42.4762 *	256.94	142.345 *	20.6733 *	65.3738 *		
23-059-WR1-C	225.46	104.24	104.24	104.24	104.24	104.24	1635.63	136.3	232.895 *	28.8976 *		
23-059-WR2-A	193.974	211.489	211.489	211.489	211.489	211.489	1424.32	90.3807 *	24.884 *	28.8976 *		
23-059-WR2-B	187.176	167.416	167.416	167.416	167.416	167.416	1524.75	117.819 *	21.7887 *	24.884 *		
23-059-WR2-C	228.923	182.906	182.906	182.906	182.906	182.906	2562.46	81.4947 *	26.2325 *	28.3977 *		
23-059-WR3-A	239.508	143.448	143.448	143.448	143.448	143.448	1651.75	81.4947 *	26.2325 *	21.7887 *		
23-059-WR3-B	239.255	131.2	131.2	131.2	131.2	131.2	1607.48	81.4947 *	26.2325 *	21.7887 *		
23-059-WR4-A	67.0281	140.342	140.342	140.342	140.342	140.342	44.979	89.0823 *	42.0424 *	68.9797		
23-059-WR4-B	327.862	133.677	133.677	133.677	133.677	133.677	2385.57	124.693 *	22.5935 *	37.2949 *		
23-059-WR4-C	280.594	133.677	133.677	133.677	133.677	133.677	3387.66	110.736 *	22.5935 *	37.2949 *		
23-059-WR-1-COMP	129.009	86.5146 *	86.5146 *	86.5146 *	86.5146 *	86.5146 *	853.689	110.736 *	22.5935 *	37.2949 *		
23-059-WR-2-COMP	196.268	7.78334 *	7.78334 *	7.78334 *	7.78334 *	7.78334 *	1749.83	111.96 *	22.5935 *	37.2949 *		

\* - Estimated Quantity  
\$ - Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

TIGER  
PA NO. 23-059



**AIMSS SCORESHEET**

SITE NAME:

TIGER

PA NUMBER:

23-059

LINE  
NO.**GROUNDWATER PATHWAY**

1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
6			39.830
7	GW - TARGETS	WELLS - 1 MI. x 2.5	0.0
8		WELLS - 1 TO 4 MI	21
9		NEAREST WELL	0
10		TARGETS SCORE	LINES 6 + 7 + 8
			21.0
		GROUNDWATER SCORE	LINES 4 x 5 x 9
			334572

**SURFACE WATER PATHWAY**

11		OBSERVED RELEASE	300
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	100
13A		CONTAINMENT	20
13B		DISTANCE TO SW	20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
16			44.171
17	SW - TARGETS	DRINKING WATER POP'N	0
18		IMPACTED DRAINAGE	1
19		WETLANDS	10
20		FISHERY	1
21		RECREATION	0
22		IRRIGATION/STOCK	0
23		T & E SPECIES HABITAT	0
24		TARGETS SCORE	SUM LINES 16 - 22
			12
		SURFACE WATER SCORE	LINES 14 x 15 x 23
			424042

**AIR PATHWAY**

25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	15
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
29			3.597
30	AIR - TARGETS	POPULATION - 4 MILES	30
31		NEAREST RESIDENCE	0
32		WETLANDS	0
33		PARKS / WILDERNESS	0
34		T & E SPECIES HABITAT	0
35		TARGETS SCORE	SUM LINES 29 - 33
			30
		AIR PATHWAY SCORE	LINES 27 x 28 x 34
			8093

**DIRECT CONTACT PATHWAY**

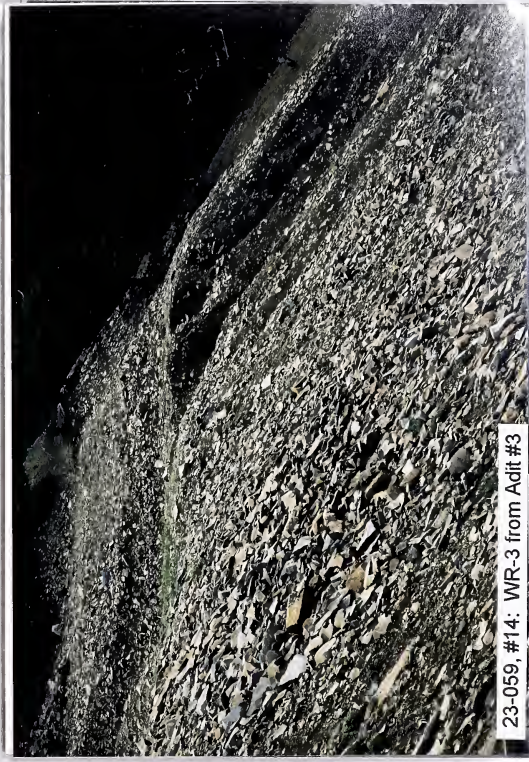
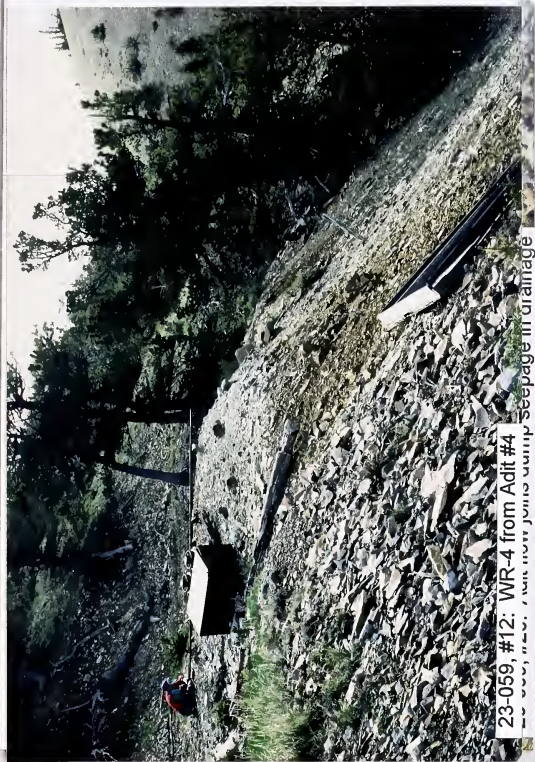
36		OBSERVED EXPOSURE	0
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	5
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)
40			3.253
41	DIRECT CONTACT TARGETS	POPULATION - 1 MILE	1
42		NEAREST RESIDENCE	0
43		RECREATIONAL USE	0
44		TARGETS SCORE	SUM LINES 40 - 42
			1
		DIRECT CONTACT SCORE	LINES 38 x 39 x 43
			81

45 TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE  
(LINES 10 + 24 + 35 + 44) / 100,000

7.67

LINE NO.			SITE NAME:	TIGER
			PA NUMBER:	23-059
	<u>SITE SAFETY</u>			
1	THREAT	ACCESSIBILITY		5
2	HAZARDS	OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	50
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	150
9	TARGETS	POPULATION - 1 MILE		1
10		NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	1
13	SITE SAFETY SCORE		(LINES 1 x 8 x 12) / 1,000	0.75









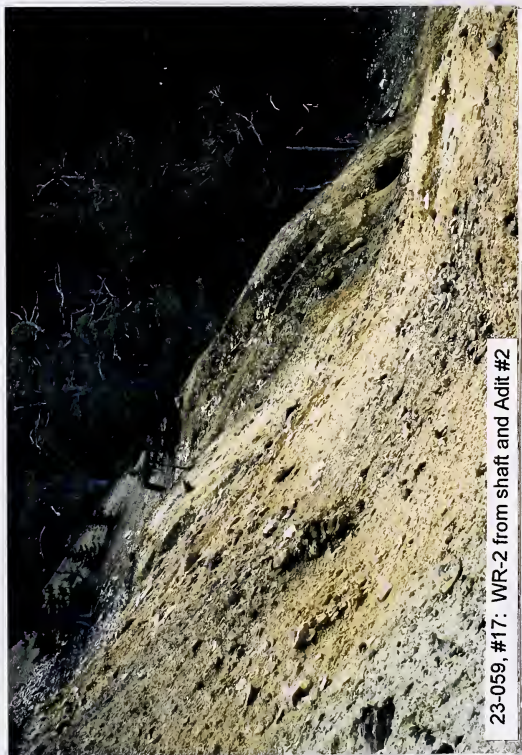
23-059, #16: WR-2 from shaft and Adit #2



23-059, #18: WR-1 from Adit #1



23-059, #15: Shaft #1 at WR-2



23-059, #17: WR-2 from shaft and Adit #2





23-059, #20: Adit flow joins dump seepage in drainage



23-059, #22: WR-1 and adit



23-059, #19: Adit (HMO) with water discharge



23-059, #21: SW-1 and SE-1 sample location





23-059, #23: WR-1 and adit



23-059, #24: WR-2, WR-3, and WR-4 from across valley



23-059, #25: SS-1 (background soil) sample location







MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: VORTEX PA#: 23-027

Date: September 10, 1993 Time: 0900-1300

Field Team Leader: Bullock

Sampling Personnel: S. Babits

Visitors: Earl McCurley, Tim Pfahler, John Koerth; MDSL  
Robin Strathy; USFS, Lewis and Clark Geologist  
Lonny Perry, Charles Ridgeway, Pete Ecker

Weather/Seasonality Observations: Calm; clear; approx. 55°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #29: SW-1; #30:  
Reclaimed tailings pond; #31: SW-2; #32: Ronco tailings pond; #33:  
SW-3; #34: TP-1A; #35: TP-1B; #36: TP-1C. Video Tape No. 6

General Comments/Observations (not covered specifically in attached Inventory Forms): Larger sapphire mine directly upstream from the Vortex has  
forfeited on their reclamation bond; much larger disturbed area.

Other Hazardous Materials/Substances Present: Lube oil and diesel  
fuel for equipment

General Comments on Potential Remedial Alternatives: Grading and  
revegetation upon completion of mining.





## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): VORTEX PA#: 23-027

Legal Description: T 13N ; R 11E ; Sec. 21 , SW1/4 SW1/4 1/4

County: JUDITH BASIN Mining District: YOGO

Latitude: N 46° 52' 15" Longitude: W 110° 20' 42"

Primary Drainage Basin and Code: Judith River/10040103

Secondary Drainage Basin: Yogo Creek

USGS Quadrangle map name(s): Indian Hill

Mine Type/Commodities: Hardrock/Yogo sapphires

Activity Status: Active X , Inactive/Exploration      , Abandoned      .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Lonny Perry,  
Utica Rt., Hobson, MT 59452. (406) 423-5390; Charles Ridgeway,  
General Delivery, Stanford, MT 59479. (406) 566-2603; Lewis and  
Clark National Forest.

Relationship to other mines/sites in the area/district: Many other  
sapphire mines located in this drainage. Ronco mine is located  
directly upstream.

Regulatory Status (Activity by other agencies)? Hardrock permits?

Past Reclamation Activities? N/A

General site features: Elevation 5360' , Slope 0°-5° ,  
Aspect Northern

Land use: Mining X , Recreational      , Residential      , Urban      ,  
Agricultural      , Other (Specify)     

Area of disturbed/unvegetated lands? 3 acres.

Dimensions: Approx. 1,390 feet x 100 feet

Predominant vegetation types: Lodgepole pine, Cottonwood, willows,  
grasses

Access: roads - good      , poor      , 4wd X , trail      .

Other logistical considerations (proximity to other sites).     

Locked gate is present.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach  
MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also  
note presence of radioactive minerals). Site lies on the northeast and southwest  
side of Yogo Creek in drainage. Yogo Creek flows southeast through  
the site, and flows into the Middle Fork Judith River 5 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: Past  
mining has occurred. Current miners have been working this site  
for approximately the last five years. Miners are extracting Yogo  
sapphires from a limestone host rock.

Mine Operation?

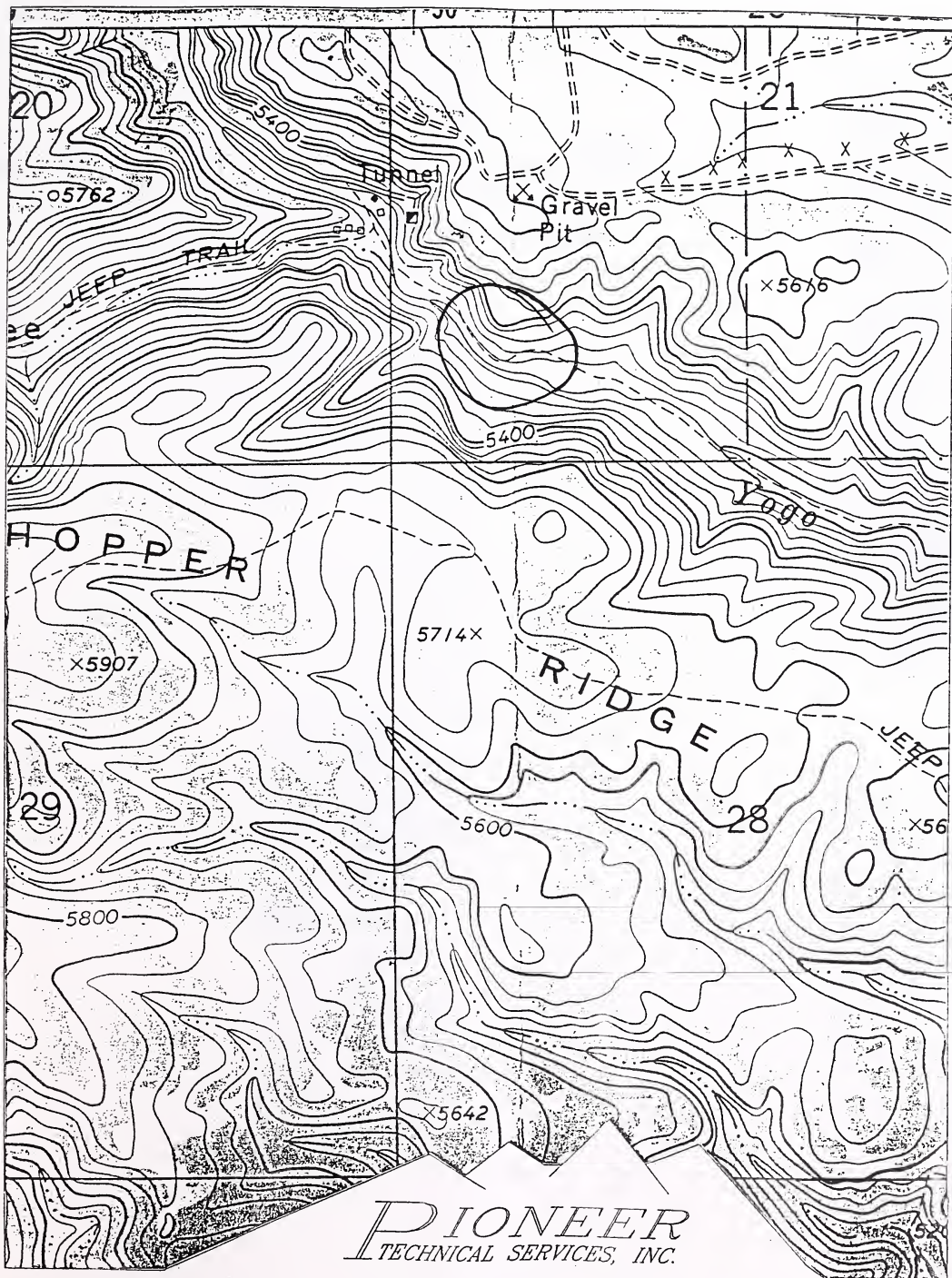
Shafts - Yes X, No     , # 2, Comment 1 active; 1 HMO on ridge  
Adits - Yes     , No X, #     , Comment       
Pits - Yes     , No X, #     , Comment       
Placers - Yes     , No X, #     , Comment       
Other - Yes     , No X, #     , Comment     

Mill Operation? Yes X, No     . If yes answer the next three  
questions:

Period(s) of Operation: Approx. 1990 to present

Origin of Ore Milled - Custom Mill      Dedicated Mill X; Number and  
names of mines that supplied mill feed:     

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting?  
Jig floatation/gravity



PIONEER  
TECHNICAL SERVICES, INC.

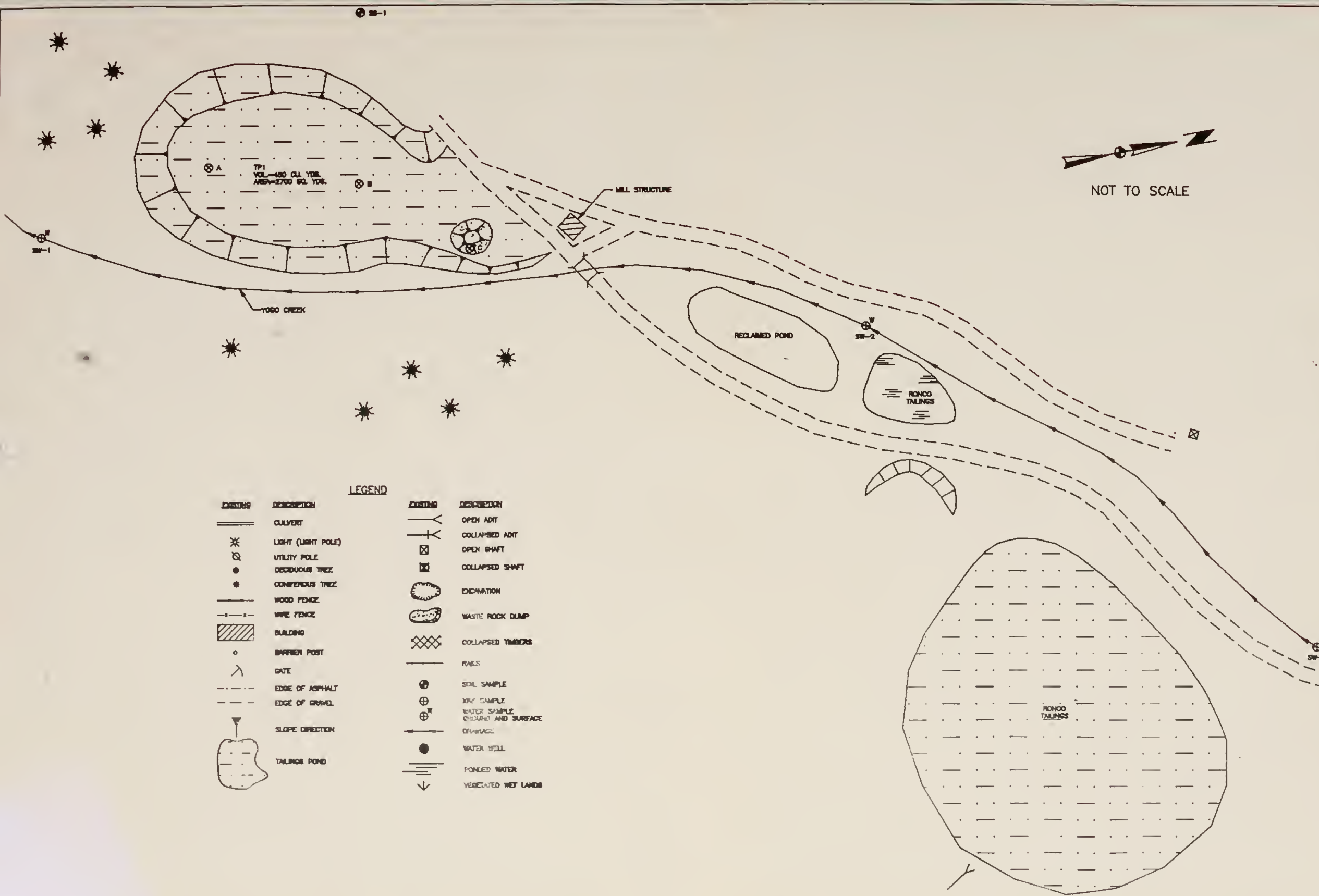
VORTEX, P.A. NO. 23-027

T13N, R11E, SECTION 20

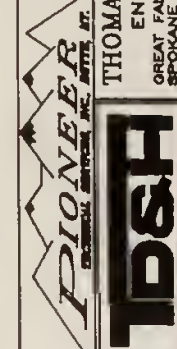
SCALE: 1" = 1000'







MONTANA DEPT. OF STATE LANDS  
HAZARDOUS MATERIAL INVENTORY  
VORTEX PA# 23-027  
YOGO DISTRICT JUDITH BASIN COUNTY



DRAWN: JTP DATE: 8 DEC. 93  
DESIGNED: JTP JOB NO.: 93-17  
APPROVED: WJB F.B. NO.:  
THOMAS, DEAN & HOSKINS INC.  
ENGINEERING CONSULTANTS  
GREAT FALLS-BOZEMAN-KALISPELL  
SPOKANE MONTANA WASHINGTON



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Fine clay in bottom of impoundment 100%; coarse material on sidewalls.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Fines are approx. 1 foot deep in bottom of impoundment.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Impoundment is in excellent condition.

Comments on potential for mitigation: Mine is active; must reevaluate following closure.





**SAMPLERS:** Bullock, S. Babits

[illegible]

D-Direct reading (Kulwy Meter); S-Saturated Paste (Orlon Meter)

Comments or deviations from SOPs: 23-027-TP-1 is composite of TP-1A through -1C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes ☐, No ☒, Number:  Identification:

Filled shafts: Yes ☐, No ☒, Number:  Identification:

Seeps/Springs: Yes ☐, No ☒, Number:  Identification:

Groundwater wells within 4 miles?: Yes ☒, No ☐;

Number of well logs:  10

Distance to nearest well used for drinking?  Approximately 3 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite ☐, Probable ☐, Possible ☐, Unlikely ☒.

Very low concentrations of heavy metals in this material.

Other observations/notes:  N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No   , Name(s): Yogo Creek

Dry streambeds: Yes   , No X, Name(s):   

Other surface water: Yes   , No X, Name(s)/Description:   

Waste materials within any floodplain: Yes X, No    Source ID(s): Tailings impoundment

Approximate Flood frequency?    1 yr,    10 yr, X 100 yr

Estimated seasonal flow of stream(s) (cfs)?   

High Flow: 50 cfs, Average Flow: 5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 25 feet

Surface water draining onto or through waste sources: Yes   , No X, Describe:   

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Irrigation, fishery, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X, No   , Distance downstream (ft)?    Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):     
Visual sedimentation problems in stream both up and downgradient of this site.



**SAMPLERS:** Bullock, S. Babits

[illegible]

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):	NM = Not measured due to meter malfunction.
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#### D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

### AMD Characteristics:

Presence and abundance of sulfides?	(SO <sub>3</sub> )
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

### General Potential for AMD Mitigation:

Area available for treatment (acres)? 5 acres of meadow land below the site.

Wetlands present: Yes , No X , Describe:

Carbonate rocks/soils: Yes ☒ , No ☐ , Describe: Limestone is abundant.

### E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10\_\_\_; 10-30 X; 30-100\_\_\_;  
100-300\_\_\_; 300-1,000\_\_\_; 1,000-3,000\_\_\_; 3,000-10,000\_\_\_; 10,000 or  
greater\_\_\_; Comments

Nearest residence(ft or miles)? Approximately 3 miles

For each source (table next page):

Available fine materials?      Surface area?

Uncovered and unvegetated?    Wet or dry?

Overall dust propagation potential:  
observed high moderate low none



**SAMPLERS:** Bullock

[illegible]

### Notes and Clarifications:

## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X, No     ,  
Describe: Miners

Population within 1 mile: 1-10     ; 10-30     ; 30-100     ; 100-300     ;  
300-1,000     ; 1,000-3,000     ; 3,000-10,000     ; 10,000 or greater     ;  
Comments None

Evidence of recreational use on site: Yes     , No X, Describe:     

Accessibility - Fences, warning signs, closed roads? Locked gate and posted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes     , No X, Comment       
Wilderness Area - Yes     , No X, Comment       
T&E Species Habitat - Yes     , No X, Comment       
Bat Habitat - Yes     , No X, Comment     

Primary Drainage     ; Secondary Drainage X; No Information     :

Riparian Habitat Quality - High     , Medium X, Low       
Wetlands Frontage - High     , Medium     , Low X  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No     , Number 2, types and locations: One HMO shaft above the mine to the north apparently not on this claim, and the actively mined shaft

Hazardous structures: Yes     , No X, Number     , types and locations:     

Unstable highwalls, pits, trenches, slopes: Yes     , No X, Number     , types and locations:     

Unstable waste piles, impoundments, undercut banks: Yes     , No X, Number     , types and locations:     

Fire and/or Explosion hazards: Yes X, No     , Explain: Blasting agent probably used on-site.

## Bibliography

MBMG Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Vortex site, Prepared by Chen-Northern, August 26, 1989.

USGS, Topographic Map, Indian Hill, Montana, 7 1/2 minute Quadrangle, 1970.



LABORATORY ANALYTICAL DATA

VORTEX  
PA NO. 23-027



Vortex PA# 23-027  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-BULLOCK  
INVESTIGATION DATE: 9/10/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-027-SE-1	22.2	335	1.0 U	3.38	19.1	4.82	8770	0.037 U	332	24	7.3 U	7.05 UJ	41.1	NR
23-027-SE-2	15.2	488	1.3 U	9.86	45.2	23.9	17000	0.045 U	392	44.4	21.9	9.17 UJ	90.9	NR
23-027-SE-3	14	385	1.0 U	8.21	37	19.5	15000	0.052 J	322	36.9	14.7	7.2 UJ	61.9	NR
23-027-TP-1	44.5	0.166 U	0.7 U	4.11	13.2	0.351 U	5540	0.039 J	137	18.9	4.94 U	4.76 UJ	1.31 U	NR
BACKGROUND	14.1	155	1.1 U	3.29	14.5	6.4	12200	0.037 J	330	11.6	9.65	7.34 UJ	44.6	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		NEUTRAL POTENT		SULFUR ACID BASE		SULFATE SULFUR		PYRITIC SULFUR		ORGANIC SULFUR		PYRITIC ACID BASE		SULFUR ACID BASE	
	%	1/1000t	%	1/1000t	%	1/1000t	%	1/1000t	%	1/1000t	%	1/1000t	%	1/1000t	%	1/1000t
23-027-TP-1	<0.01	0	905	905	<0.01	905	<0.01	<0.01	<0.01	0.12	0.12	0	0	905	905	905

MECHANICAL ANALYSIS

FIELD ID	% CLAY	% SAND	% SILT	% COARSE MATERIAL (>2mm)
23-027-SE-1	2	95	4	55
23-027-SE-2	10	63	27	0
23-027-SE-3	4	63	33	0

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	CALC. (mg CaCO3/L)
23-027-SW-1	0.96 JX	91.8	2.57 U	9.7 U	6.97	1.55 U	102	0.12	4.08 UJ	12.7 U	3.23	30.7 UJ	8.77	177
23-027-SW-2	1.38 JX	98.4	2.57 U	9.7 U	6.83 U	1.55 U	102	0.12 U	4.08 UJ	12.7 U	1.47	30.7 UJ	7.57 U	188
23-027-SW-3	0.96 U	110	2.57 U	9.7 U	6.83 U	2.47 J	99	0.12 U	4.08 U	12.7 U	0.72	30.7 U	8.17	203

Wet Chemistry Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	TOTAL SUSPENDED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE	TSS
23-027-SW-1	267	< 4	< 5.0	12	< 0.05	NR	< 4
23-027-SW-2	247	< 4	< 5.0	14	< 0.05	NR	< 4
23-027-SW-3	265	< 4	< 5.0	14	< 0.05	NR	< 4

LEGEND

- SE1 - Downstream of tailings impoundment, approx. 100'.  
SE2 - Between exposed and reclaimed pond, owned by Renco. Downstream of shaft.  
SE3 - At Renco intake pond above Renco tailings, downstream of placer tailings.  
TP1 - Composite of subsamples TP1A, 1B, and 1C.  
BACKGROUND - From the Vortex Mine (23-027-SS-1).
- SW1 - Same as sample SE1.  
SW2 - Same as sample SE2.  
SW3 - Same as sample SE3.





**XRF ANALYSIS RESULTS**

**VORTEX  
PA NO. 23-027**



Mine Name: Vortex PA# 23-027  
XRF Field Analyses  
Results in PPM

XRF SAMPLE ID	CrHl	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
23-027-TP1-A		912 \$	247568 \$	648 \$	110 \$	385 \$	4895 \$	65 \$		94 \$	28 \$	202 \$
23-027-TP1-B		912.232 *	247568	644.928		384.865 *	4894.86			94.3428 *	27.8978 *	202.455
23-027-TP1-C			230552	648.127		355.606 *	3923.36			101.948 *	27.1051 *	134.818
23-027-TP-1-COMP		957.755 *	184946	1012.32	190.118 *	295.578 *	6112.78			83.197 *	34.4148 *	198.159
	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th	
23-027-TP1-A	30 \$								118 \$		7 \$	
23-027-TP1-B	30.2375		3.98673						118.089 *		6.83316 *	
23-027-TP1-C	8.04048 *							40.9168 *			8.52244 *	
23-027-TP-1-COMP	37.3802							36.4603 *	94.5784 *		9.63462 *	

\* - Estimated Quantity

\$ -- Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

VORTEX  
PA NO. 23-027





# **AIMSS SCORESHEET**

SITE NAME:  
PA NUMBER:

VORTEX  
23-027

LINE NO.			
<b>GROUNDWATER PATHWAY</b>			
1		OBSERVED RELEASE	0
2		EXCEEDENCES	0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT	20
3B		GW DEPTH	2
3C		POTENTIAL TO RELEASE	LINES 3A x 3B
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.011
6		WELLS - 1 MI. x 2.5	0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI	10
8		NEAREST WELL	0
9		TARGETS SCORE	LINES 6 + 7 + 8 10.0
10		<b>GROUNDWATER SCORE</b>	<b>LINES 4 x 5 x 9 4</b>
<b>SURFACE WATER PATHWAY</b>			
11		OBSERVED RELEASE	0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES	0
13A		CONTAINMENT	20
13B		DISTANCE TO SW	10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C 200
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.011
16		DRINKING WATER POP'N	0
17		IMPACTED DRAINAGE	0
18		WETLANDS	0
19	SW - TARGETS	FISHERY	1
20		RECREATION	5
21		IRRIGATION/STOCK	2
22		T & E SPECIES HABITAT	0
23		TARGETS SCORE	SUM LINES 16 - 22 8
24		<b>SURFACE WATER SCORE</b>	<b>LINES 14 x 15 x 23 18</b>
<b>AIR PATHWAY</b>			
25		OBSERVED RELEASE	0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT	10
26B		DISTANCE TO POPULATION	5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B
27		LIKELIHOOD SCORE	LINES 25 + 26C 50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.004
29		POPULATION - 4 MILES	10
30		NEAREST RESIDENCE	0
31	AIR - TARGETS	WETLANDS	10
32		PARKS / WILDERNESS	0
33		T & E SPECIES HABITAT	0
34		TARGETS SCORE	SUM LINES 29 - 33 20
35		<b>AIR PATHWAY SCORE</b>	<b>LINES 27 x 28 x 34 4</b>
<b>DIRECT CONTACT PATHWAY</b>			
36		OBSERVED EXPOSURE	200
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY	5
37B		DISTANCE TO POPULATION	5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B
38		LIKELIHOOD SCORE	LINES 36 + 37C 225
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET) 0.004
40	DIRECT CONTACT	POPULATION - 1 MILE	0
41	TARGETS	NEAREST RESIDENCE	0
42		RECREATIONAL USE	0
43		TARGETS SCORE	SUM LINES 40 - 42 0
44		<b>DIRECT CONTACT SCORE</b>	<b>LINES 38 x 39 x 43 0</b>
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>		<b>(LINES 10 + 24 + 35 + 44) / 100,000 0.00</b>

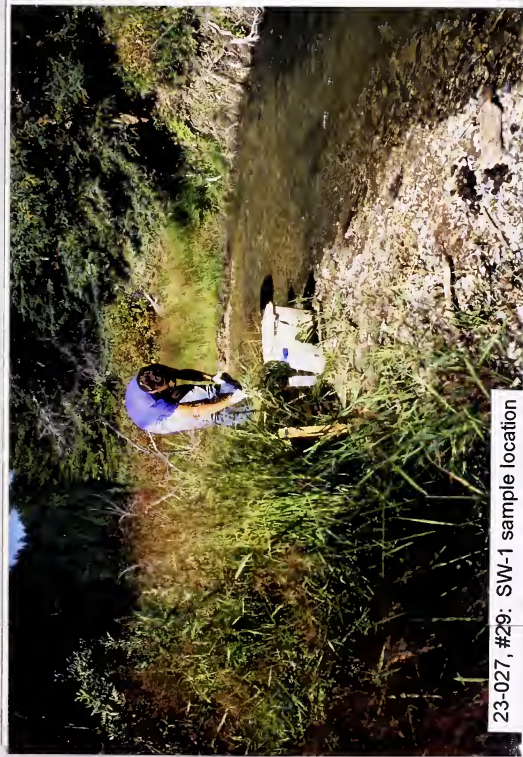
LINE  
NO.

SITE NAME:  
PA NUMBER:

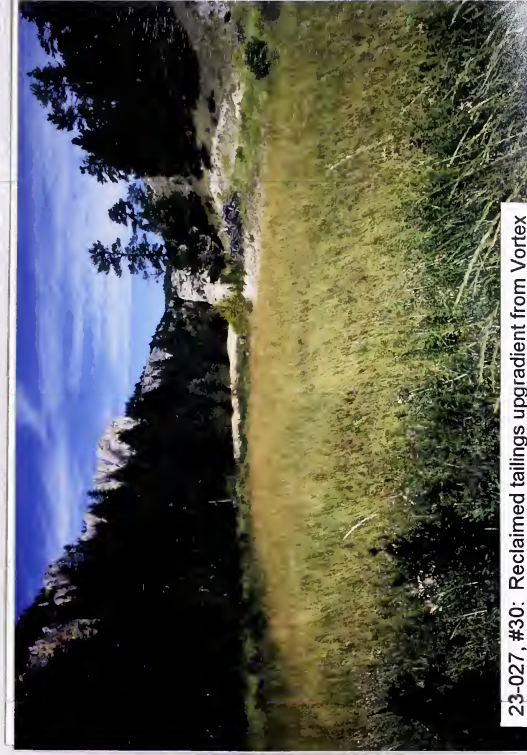
VORTEX  
23-027

**SITE SAFETY**

1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		50
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	150
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>



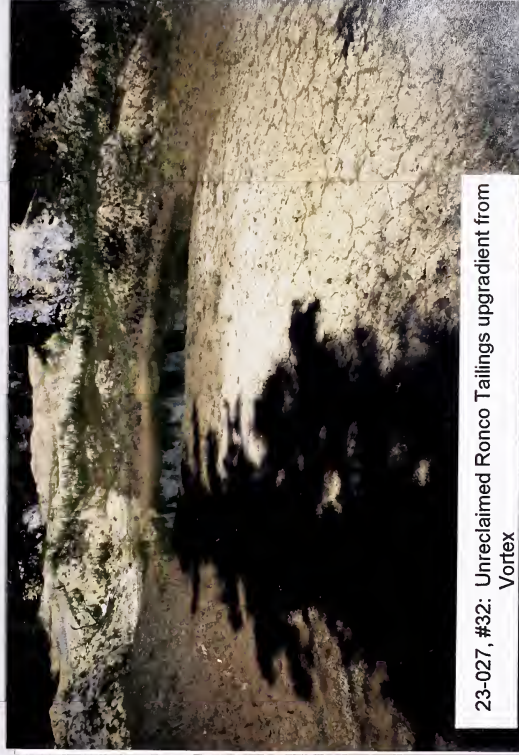
23-027, #29: SW-1 sample location



23-027, #30: Reclaimed tailings upgradient from Vortex

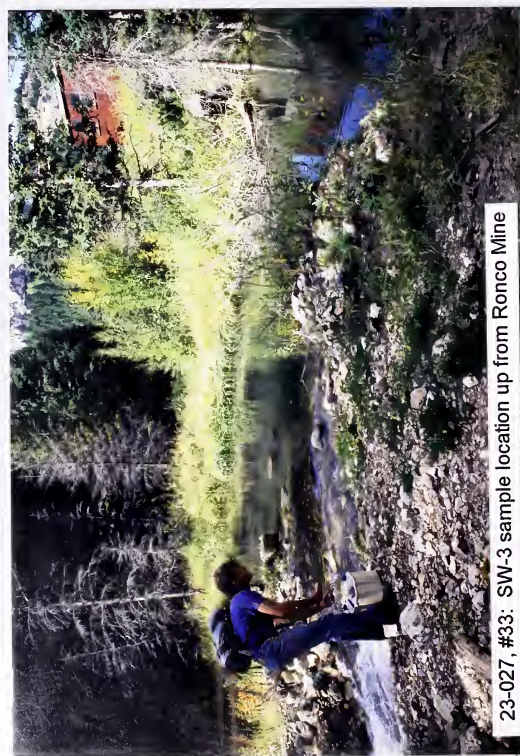


23-027, #31: SW-2 sample location



23-027, #32: Unreclaimed Ronco Tailings upgradient from Vortex







MONTANA DEPARTMENT OF STATE LANDS  
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY  
SITE INVESTIGATION LOG SHEET

Mine/Site Name: NE NE S31 PA#: 23-079

Date: September 10, 1993 Time: 1330-1600

Field Team Leader: Bullock, Pioneer

Sampling Personnel: S. Babits, Pioneer

Visitors: Earl McCurley, Tim Pfahler, John Koerth; MDSL  
Robin Strathy; USFS, Lewis and Clark Geologist

Weather/Seasonality Observations: Clear; windy; 70°F.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #37: SW-1; #1: SW-2;  
#2, #3: TP-1; #4: Mill; #5: SW-3. Video Tape No. 6

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove  
tailings from drainage.



## I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): NE NE S31 PA#: 23-079

Legal Description: T 14N ; R 10E ; Sec. 31 , NE1/4 NE1/4 1/4

County: JUDITH BASIN Mining District: YOGO

Latitude: N 46° 56' 07" Longitude: W 110° 29' 42"

Primary Drainage Basin and Code: Yogo Creek/10040103

Secondary Drainage Basin: Elk Creek

USGS Quadrangle map name(s): Bandbox Mountain

Mine Type/Commodities: Millsite/Unknown

Activity Status: Active    , Inactive/Exploration    , Abandoned X .

Ownership status: Known YX N ; private/public? Public

Owner, Agent, or Contact (Include address and phone when available): Bill Skelton,  
General Delivery, Stanford, MT 59479. (406) 566-2328; Lewis and  
Clark National Forest.

Relationship to other mines/sites in the area/district: The mine  
is approx. 1/4 mile up mountain above the millsite.

Regulatory Status (Activity by other agencies)? Hardrock permits?  
Past Reclamation Activities? N/A

General site features: Elevation 6950' , Slope 10°-15° ,  
Aspect Western

Land use: Mining    , Recreational X , Residential    , Urban    ,  
Agricultural X , Other(Specify)   

Area of disturbed/unvegetated lands? 1/8 acres.  
Dimensions:   

Predominant vegetation types: Douglas fir, Lodgepole pine, spruce,  
juniper, willows, blue bunch wheat grass.

Access: roads - good    , poor    , 4wd X , trail    .  
Other logistical considerations (proximity to other sites).



Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Tailings lie in the intermittent drainage to Elk Creek. Elk Creek is a perennial stream that flows south past the site to the confluence with Yogo Creek 1 1/4 miles away.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?

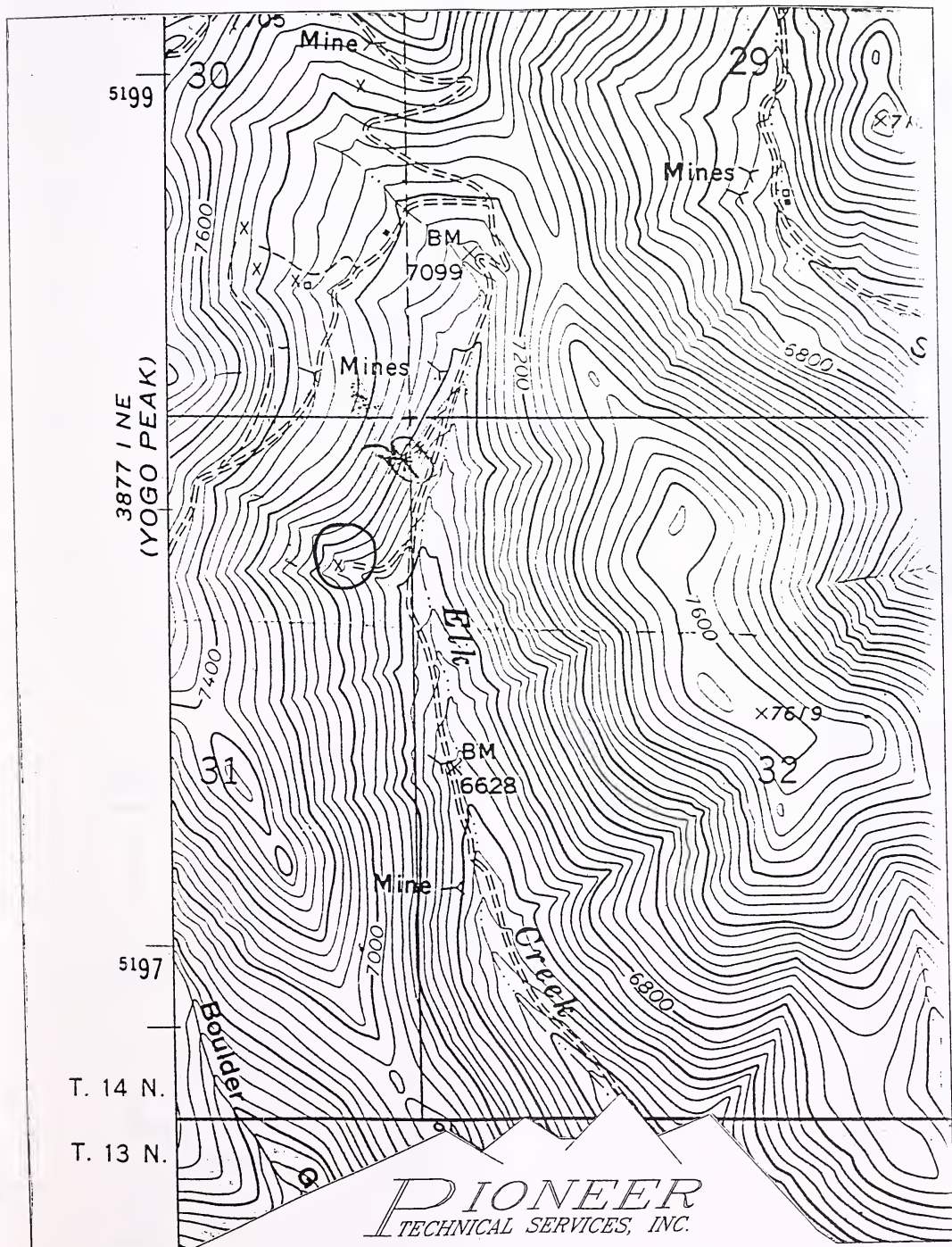
Shafts - Yes     , No X, #     , Comment                       
Adits - Yes     , No X, #     , Comment                       
Pits - Yes     , No X, #     , Comment                       
Placers - Yes     , No X, #     , Comment                       
Other - Yes     , No X, #     , Comment                     

Mill Operation? Yes X, No     . If yes answer the next three questions:

Period(s) of Operation: Possibly in the 1940's

Origin of Ore Milled - Custom Mill      Dedicated Mill     ; Number and names of mines that supplied mill feed: No information found in literature.

Process? Hg-amalgam, CN<sup>-</sup> leach (vat, heap), floatation, smelting? No information found in literature.

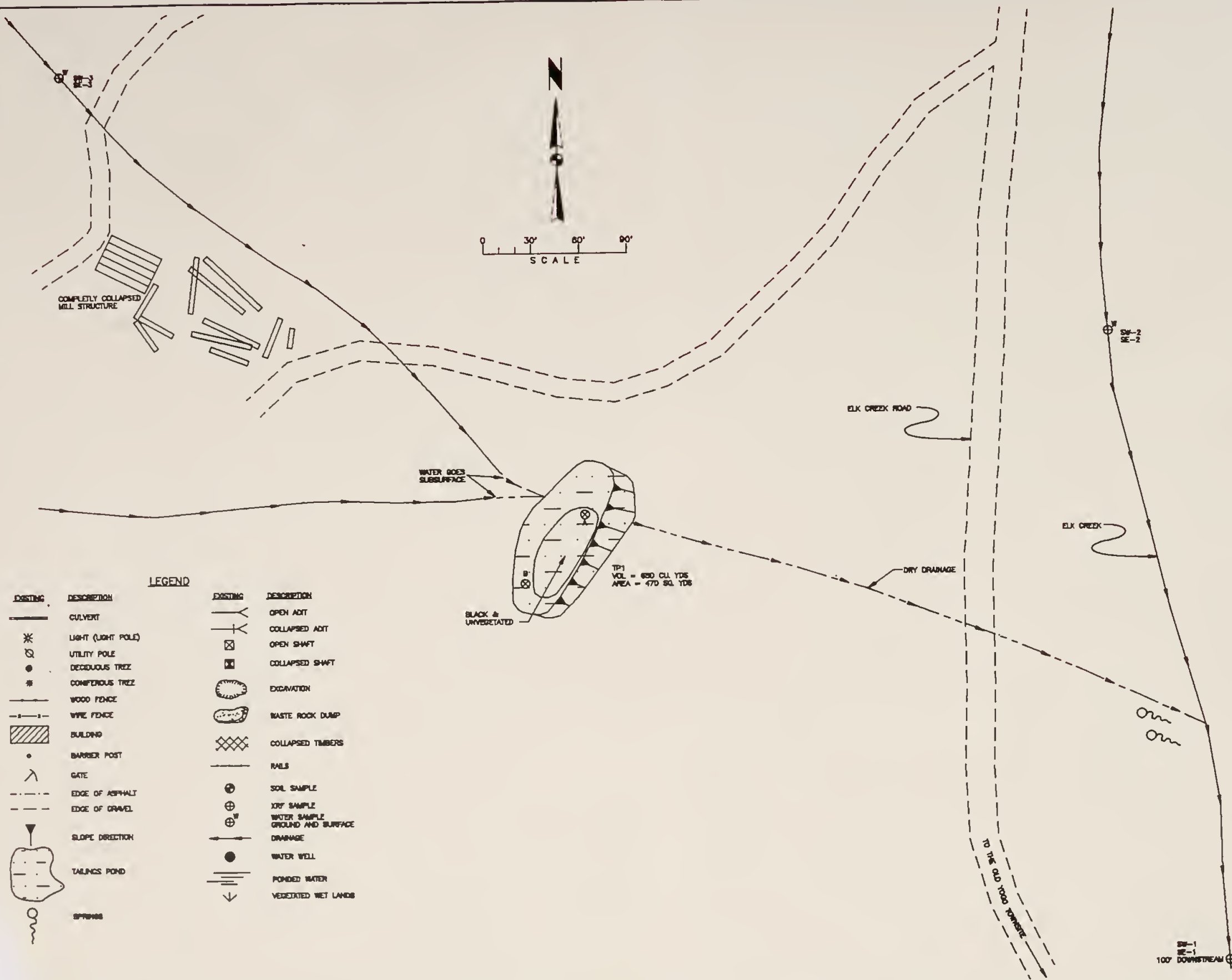


NE NE S31, P.A. NO. 23-079

T14N, R10E, SECTION 31

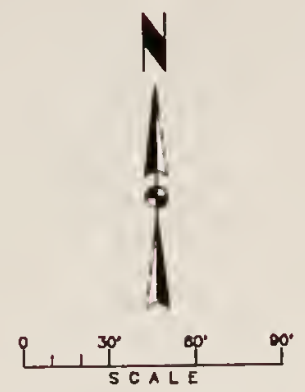
SCALE: 1" = 1000'





LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
	CULVERT		OPEN ADIT
	LIGHT (LIGHT POLE)		COLLAPSED ADIT
	UTILITY POLE		OPEN SHAFT
	DECIDUOUS TREE		COLLAPSED SHAFT
	CONIFEROUS TREE		EXCAVATION
	WOOD FENCE		WASTE ROCK DUMP
	WIRE FENCE		COLLAPSED TIMBERS
	BUILDING		RAILS
	BARBER POST		SOIL SAMPLE
	GATE		10' SAMPLE
	EDGE OF ASPHALT		WATER SAMPLE
	EDGE OF GRAVEL		GROUND AND SURFACE
	SLOPE DIRECTION		DRAINAGE
	TAILINGS POND		WATER WELL
	SPRINGS		PONDED WATER
			VEGETATED WET LANDS



MONTANA DEPT. OF STATE LANDS  
 HAZARDOUS MATERIAL INVENTORY  
 NE NE SECTION 31 PA# 23-079  
 YOGO DISTRICT JUDITH BASIN COUNTY

**PIONEER**  
 ENGINEERING CONSULTANTS  
 GREAT FALLS-BOZEMAN-KALISPELL  
 SPOKANE

**TDSH**

THOMAS, DEAN & HOSKINS INC.  
 ENGINEERING CONSULTANTS  
 MONTANA  
 WASHINGTON

DRAWN: JTP DATE: 8 DEC 83  
 DESIGNED: TPR JOB NO.: 83-17  
 APPROVED: WJB F.B. NO.:



## II. INFORMATION COLLECTED ON SITE

### A. SOLID MATRIX WASTE CHARACTERIZATION

#### 1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runoff/runoff controls in place, are wastes covered or vegetated, pond liners intact?

#### 2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): \_\_\_\_\_  
Fine sand, 80%; silt, 20%.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): No obvious stratification.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): \_\_\_\_\_  
Tailings are moist below the surface.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Berm containing tailings is in good condition.

Comments on potential for mitigation: Cap or remove from drainage.





# SOURCE INVENTORY FORM

**SAMPLERS:** Bullock, S. Babits, McCurley

[illegible]

\*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

**Comments or deviations from SOPs:** 23-079-Tp-1 is composite of TP-1A through -1C. 23-079-Tp-2 is composite of TP-2A through -2C.

## B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map.

Flowing adits: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Filled shafts: Yes\_\_\_, No X, Number:\_\_\_ Identification:\_\_\_\_\_

Seeps/Springs: Yes X, No\_\_\_, Number:\_\_\_ Identification: Two seep areas below mill in the Elk Creek drainage.

Groundwater wells within 4 miles?: Yes\_\_\_, No X ;  
Number of well logs: 0

Distance to nearest well used for drinking? > 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);  
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?

Definite\_\_\_, Probable\_\_\_, Possible X, Unlikely X.

Source volume is very small and shallow, although contaminant levels are high.

Other observations/notes: N/A

## SAMPLERS:

[illegible]

**FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?**

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

### C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map of topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No     , Name(s): Elk Creek and intermittent tributary to Elk Creek

Dry streambeds: Yes     , No X, Name(s):                     

Other surface water: Yes     , No X, Name(s)/Description:                     

Waste materials within any floodplain: Yes X, No      Source ID(s):       
Tailings are in the intermittent drainage.

Approximate Flood frequency? X 1 yr,      10 yr,      100 yr

Estimated seasonal flow of stream(s) (cfs)? Intermittent tributary  
High Flow: 1 cfs, Average Flow: 0-25 gpm

Distance between waste source(s) and nearest surface water body (ft)?       
Tailings are located within the intermittent drainage.

Surface water draining onto or through waste sources: Yes X, No     ,  
Describe: During high flow events.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)  
Placer mining, grazing

Observed erosional/sedimentation/stream turbidity problems? Yes     ,  
No X, Distance downstream (ft)?                      Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):       
None observed during this investigation.



**SAMPLERS:** Bullock, S. Babits

[illegible]

FLOW: Estimated (E) or Measured (M) ?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not measured due to meter malfunction.

st

2

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## ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

**SAMPLERS:** Bullock, S. Babits

[illegible]

**Notes and Clarifications:** TP-1 and TP-2 are two separate sample points in one small impoundment.



## F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes\_\_\_\_, No X  
Describe: \_\_\_\_\_

Population within 1 mile: 1-10\_\_\_\_; 10-30\_\_\_\_; 30-100\_\_\_\_; 100-300\_\_\_\_;  
300-1,000\_\_\_\_; 1,000-3,000\_\_\_\_; 3,000-10,000\_\_\_\_; 10,000 or greater\_\_\_\_;  
Comments None

Evidence of recreational use on site: Yes\_\_\_\_, No X, Describe: Not  
at the millsite

Accessibility - Fences, warning signs, closed roads? 200' walk from  
Elk Creek Road

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Wilderness Area - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
T&E Species Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_  
Bat Habitat - Yes\_\_\_\_, No X, Comment \_\_\_\_\_

Primary Drainage X; Secondary Drainage\_\_\_\_; No Information\_\_\_\_:

Riparian Habitat Quality - High\_\_\_\_, Medium X, Low\_\_\_\_  
Wetlands Frontage - High\_\_\_\_, Medium\_\_\_\_, Low X  
Fisheries Habitat and Species Classification - 4  
Sport Fishery Classification - 4

## G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Hazardous structures: Yes\_\_\_\_, No X, Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable highwalls, pits, trenches, slopes: Yes\_\_\_\_, No X, Number\_\_\_\_,  
types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Unstable waste piles, impoundments, undercut banks: Yes\_\_\_\_, No X,  
Number\_\_\_\_, types and locations:\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Fire and/or Explosion hazards: Yes X, No\_\_\_\_, Explain: Debris from  
old mill  
\_\_\_\_\_

LABORATORY ANALYTICAL DATA

NE NE S31  
PA NO. 23-079



NE NE S31 PA# 23-079  
AMRB HAZARDOUS MATERIALS INVENTORY  
INVESTIGATOR: PIONEER-BULLOCK  
INVESTIGATION DATE: 9/10/93

SOLID MATRIX ANALYSES

Metals in soils  
Results per dry weight basis

FIELD ID	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Co (mg/kg)	Cr (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Mn (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Sb (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-079-SE-1	34	193	3.3 U	54.2	86	2930	169000	0.189 J	650	79.6	36.1	22.5 UJ	164	NR
23-079-SE-2	6.74	36	1.1 U	12.3	371	25300	0.040 U	0.040 U	209	20.8	15.4	7.5 UJ	46.9	NR
23-079-TP-1	9.95	113	1.2 U	119	30.7	9780	196000	0.203 J	1070	97.5	32.1	8 UJ	279	NR
23-079-TP-2	10.6	107	1.1 U	118	26.8	11000	184000	0.178	1050 J	91.8	22	7.5 UJ	268	NR
BACKGROUND	14.1	155	1.1 U	3.29	14.5	6.4	12200	0.037 J	330	11.6	9.65	7.34 UJ	44.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	ACID BASE %	NEUTRAL POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000	ORGANIC SULFUR %	PYRITIC SULFUR %	PYRITIC ACID BASE POTENT. 1/1000	SULFUR ACID BASE POTENT. 1/1000
23-079-TP-1	0.58	18.1	68.8	50.7	0.87	1.19	37.2	31.6
23-079-TP-1DUP	0.59	18.4	70.4	52	0.89	1.16	36.2	34.2
23-079-TP-2	0.65	20.3	69.2	48.8	0.9	1.17	36.6	32.6

WATER MATRIX ANALYSES

Metals in Water  
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
23-079-SW-1	0.96 U	36.8	2.57 U	9.7 U	6.83 U	3.87 J	37.1	0.12 U	4.08 U	12.7 U	0.76	30.7 U	13	149
23-079-SW-2	1.33	38.1	2.57 U	9.7 U	6.83 U	2.7 J	71.8	0.12 U	4.08 U	12.7 U	0.72 U	30.7 U	13.1	128
23-079-SW-3	0.96 U	23	2.57 U	9.7 U	6.83 U	2.6 J	11.8 U	0.12 U	4.08 U	12.7 U	0.72 U	30.7 U	11.2	116

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry  
Results in mg/l

FIELD ID	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
23-079-SW-1	189 <	5.0	10 <	0.05	NR
23-079-SW-2	169 <	5.0	6 <	0.05	NR
23-079-SW-3	154 <	5.0	10	0.06	NR

LEGEND

SE1 - Downstream Elk Creek.

TP1 - Upstream Elk Creek.

TP2 - Composite of subsamples TP1A, 1B, and 1C.

TP2 - Composite of subsamples TP2A, 2B, and 2C.

BACKGROUND - From the Vortex Mine (23-027-SS-1).

TP1DUP - Duplicate of the 23-079-TP-1 sample.

SW1 - Same as sample SE1.

SW2 - Same as sample SE2.

SW3 - Upstream intermittent tributary.



XRF ANALYSIS RESULTS

NE NE S31  
PA NO. 23-079





\* – Estimated Quantity  
\$ – Unvalidated Data



ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS)  
SCORESHEET

NE NE S31  
PA NO. 23-079



# AIMSS SCORESHEET

SITE NAME:

NE NE S31

PA NUMBER:

23-079

LINE NO.				
		<b>GROUNDWATER PATHWAY</b>		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD	CONTAINMENT		20
3B	OF RELEASE	GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.069
6		WELLS - 1 MI. x 2.5		0.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		0
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	0.0
10		<b>GROUNDWATER SCORE</b>	LINES 4 x 5 x 9	0
		<b>SURFACE WATER PATHWAY</b>		
11		OBSERVED RELEASE		300
12	SW - LIKELIHOOD	EXCEEDENCES		0
13A	OF RELEASE	CONTAINMENT		20
13B		DISTANCE TO SW		10
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	200
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	500
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.240
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19	SW - TARGETS	FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	3
24		<b>SURFACE WATER SCORE</b>	LINES 14 x 15 x 23	360
		<b>AIR PATHWAY</b>		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD	CONTAINMENT		10
26B	OF RELEASE	DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.008
29		POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	11
35		<b>AIR PATHWAY SCORE</b>	LINES 27 x 28 x 34	4
		<b>DIRECT CONTACT PATHWAY</b>		
36		OBSERVED EXPOSURE		0
37A	LIKELIHOOD OF	ACCESSIBILITY		20
37B	EXPOSURE	DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.002
40	DIRECT CONTACT	POPULATION - 1 MILE		0
41	TARGETS	NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		<b>DIRECT CONTACT SCORE</b>	LINES 38 x 39 x 43	0
45	<b>TOTAL SITE HUMAN &amp; ENVIRONMENTAL HAZARD SCORE</b>			
	(LINES 10 + 24 + 35 + 44) / 100,000			0.00

SITE NAME:  
PA NUMBER:

NE NE S31  
23-079

LINE  
NO.

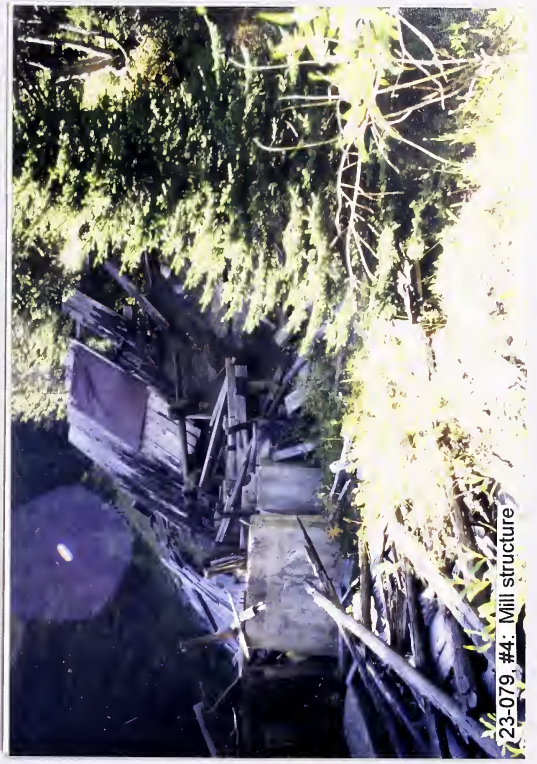
**SITE SAFETY**

1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		<b>SITE SAFETY SCORE</b>	<b>(LINES 1 x 8 x 12) / 1,000</b>	<b>0.00</b>





23-079, #2: TP-1



23-079, #4: Mill structure



23-079, #1: SW-2 sample location



23-079, #3: TP-1





23-079, #5: SW-3



23-079, #37: SW-1 sample location (downgradient)



